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for GARMENT *and* PATTERN CONSTRUCTION

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Department of Home Economics, New Jersey College for Women, New Brunswick, N. J.

Home Economics Department, The Woman's College of the University of North Carolina, Greensboro, N. C.

Department of Home Economics, Pennsylvania State College, State College, Pa.

UNITED STATES DEPARTMENT OF AGRICULTURE
in cooperation with the Work Projects Administration

MISCELLANEOUS PUBLICATION No. 454

WOMEN'S MEASUREMENTS FOR GARMENT AND PATTERN CONSTRUCTION

By Ruth O'Brien, *chief*

and

William C. Shelton, *associate statistician*

TEXTILES AND CLOTHING DIVISION
BUREAU OF HOME ECONOMICS

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Foreword

In this study, weight and 58 measurements used in pattern and garment construction were taken on each of 14,698 women living in the United States. Sponsored and supervised by the Bureau of Home Economics from July 14, 1939, to June 30, 1940, under a Federal-project grant of the Work Projects Administration, the study was conducted as a series of State Work Projects Administration projects in Arkansas, California, Illinois, Maryland, New Jersey, North Carolina, and Pennsylvania, with the cooperation of local universities and other educational institutions.

Appreciation is expressed to the many Federal and State Work Projects Administration officials who assisted by making funds and personnel available. At one time 494 relief workers were employed on the study. The courtesies extended by W. R. F. Stier of the Federal Work Projects Administration office were especially helpful. The following staff members of the cooperating institutions worked directly on the study, making arrangements for the measuring in their communities and supervising the local groups of measurers:

Isabella C. Wilson, head, Department of Home Economics, assisted by Olivia Smenner, head, Division of Clothing and Textiles, University of Arkansas, Fayetteville, Ark.

Agnes Fay Morgan, chairman and professor, Department of Home Economics, University of California, assisted by Harriet G. Eddy, State home demonstration leader, and Ethelwyn M. Dodson, extension specialist in clothing, Extension Service, College of Agriculture, University of California, Berkeley, Calif.

Frances L. Swain, director of household arts, Board of Education, Chicago, Ill.

Marie Mount, dean, College of Home Economics, University of Maryland, College Park, Md.

Helen W. Hazen, head, Department of Home Economics, New Jersey College for Women, assisted by Inez La Bossier, extension specialist in clothing, Extension Service, New Jersey State College of Agriculture, New Brunswick, N. J.

Margaret M. Edwards, head, Home Economics Department, assisted by Agnes M. Coxe, The Woman's College of the University of North Carolina, Greensboro, N. C.

Pauline Beery Mack, director of The Ellen H. Richards Institute and professor of textile chemistry, The Pennsylvania State College, State College, Pa.

Acknowledgment is made to Erna M. Driftmier, anthropometrist in charge of the measuring, and to her assistant, Edwina B. McNaughton, who, when it became necessary for Miss Driftmier to leave the project at the close of the training schools for measurers, gave general supervision to all the measuring units until she was needed to direct the project in Chicago. Frances S. Boiseau then assumed her duties.

Clarice L. Scott, assistant home economics specialist, and Margaret Smith, junior home economics specialist, both of the Bureau of Home Economics, advised in setting up the list of measurements used in the study. The measuring procedures followed were largely those employed in a children's measurement project, recently completed by the Bureau, of which Eleanor P. Hunt was the anthropometrist in charge of measuring. The necessary additional procedures were devised by Miss Driftmier, assisted by Miss McNaughton, Mrs. Boiseau, Stell Barnes, and Frances Metcalf.

The methods used in the statistical analysis of the data follow, to a large extent, those developed by Meyer A. Girshick in connection with the study of children's measurements. This contribution, as well as other courtesies he extended during the project, are greatly appreciated.

Mrs. Boiseau posed the subjects and supervised the taking of the photographs included in this report to illustrate the measuring procedures. Her assistance in assembling the material used as a basis for that section of the bulletin is also gratefully acknowledged.

Appreciation is also expressed to Lennah Curtiss Zens, administrative assistant; to Albert E. Craig, who was in complete charge of editing and coding the schedules and of the machine tabulation; and to Marion D. Bingham, supervisor of the statistical pool.

LOUISE STANLEY,
Chief, Bureau of Home Economics.

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Purpose, Organization, and Scope of the Study

This research project was undertaken in order to provide measurements which could be used for improving the fit of women's garments and patterns. No scientific study of body measurements used in the construction of women's clothing has ever been reported.[1] The measurements used have grown up in the industry, apparently chiefly by trial and error, based on measurements taken on a few women by various inaccurate procedures. As a result, there are no standards for garment sizes, and retailers and consumers are subjected to unnecessary expense and harassed by the difficulties involved in obtaining properly fitting clothing.

Garments labeled the same size but made by different manufacturers vary greatly, and few of them fit without alteration. Women often have to add to the price of ready-made clothes large additional sums for alterations. In some cases, these may amount to as much as an additional 25 percent on the cost of a dress. Garments that cannot be fitted and altered where bought are often returned to the store because of wrong size. This means a loss of money and good will to the retailer and annoyance and waste of time to the woman purchaser. Mail-order houses have a large volume of such returns, which add to the cost of merchandise and work a hardship on rural homemakers who frequently must buy by mail.

To be satisfactory, garment and pattern sizing must be based on a practical and logical classification of body types. Therefore this study included not only the measuring of a large group of women, but also a detailed statistical analysis of the results. The latter was so planned as to provide data from which the garment and pattern industry can develop a system of sizes satisfactory to consumers and all branches of the trade. To this end, special attention was given to discovering key measurements of the body; that is, a few important measurements from which all the others can best be predicted.

As is discussed on pages 31 to 41, the analysis showed that girth measurements of the body have little relation to vertical (height) measurements. For example, bust measure, which is often used as a basis for sizing women's dresses, cannot be used to predict the vertical measurements. Women with bust measurements of 46 or 47 inches are no taller, on the average, than those with bust 32. Women 5 feet 9 inches tall have no larger busts, on the average, than those 5 feet tall. A combination of a vertical and a horizontal measurement must be used if all the measurements are to be accurately predicted.

Height seems to be the most practical vertical measurement to use in such a combination. It is the easiest one to take and is as accurate a predictor of other vertical measurements as is any other one measurement. However, no one girth measurement is as good a predictor of the other girths as is weight. In other words, a stature-weight combination would be the best basis for classifying women's body types for the establishment of a standard system of garment and pattern sizes. Figures for setting up such a system are given in table 18. Data for alternative systems which would not be so generally satisfactory are also included in this report.

Organization of the Project

Through the courtesy of State Work Projects Administration offices, State units were organized in Arkansas, California, Illinois, Maryland, New Jersey, North Carolina, and Pennsylvania. Under a Federal Work Projects Administration grant, a unit was also set up in the District of Columbia where procedures were tested before they were used in the States. Each cooperating educational institution provided the part-time services of a staff member who advised with the local Work Projects Administration office and assisted in enlisting women to be measured (see p. II).

The Bureau of Home Economics employed a staff to develop the measuring techniques and to train the measurers. All were women who had been trained and had worked as supervisors of measurers on a children's measurement study previously completed.[2] Four of these workers subsequently were employed

[1] O'Brien, Ruth. An annotated list of literature references on garment sizes and body measurements. U. S. Dept. Agr. Misc. Pub. 78, 48 pp. 1930.

[2] O'Brien, Ruth, Girshick, Meyer A., and Hunt, Eleanor P. Body measurements of American boys and girls for garment and pattern construction. A comprehensive report of measuring procedures and statistical analysis of data on 147,000 American children. U. S. Dept. Agr. Misc. Pub. 366, 141 pp., illus. 1941.

by the State Work Projects Administration offices to supervise the measuring in Illinois, New Jersey, North Carolina, and Pennsylvania. Another remained in Washington as a supervisor of the District of Columbia unit. In California, a woman who had also been trained and had worked as a measurer throughout the previous study was employed by the local Work Projects Administration to supervise the measuring in that State.

The measurements were taken by these supervisors and by Work Projects Administration measurers, recorders and other aides, organized in measuring squads. All were trained in the procedures by the anthropometrist in charge or by her assistant.

Printed schedules and mimeographed forms as well as measuring instruments were supplied from Washington, and all completed schedules were returned there where they were edited, coded, and analyzed, under the supervision of members of the Bureau of Home Economics staff. This part of the work was conducted as a second Federal Work Projects Administration project.

Women Measured

The women included in the study were white residents and visitors in Arkansas, California, Illinois, Maryland, New Jersey, North Carolina, Pennsylvania, and the District of Columbia. They were 18 years of age and older and were both native and foreign-born. Most of them lived in urban areas (see p. 47).

Measuring centers were set up in the cities and towns, and invitations issued to women through their organizations. Colleges, Work Projects Administration sewing rooms, social welfare centers, and other women's organizations were invited to participate. Some measuring was also done in private homes. In all, 14,698 women were measured, distributed by State in which measured and county of residence as shown in the following tabulation:

State and county	*Number of women*
Arkansas:	
Arkansas	2
Ashley	4
Benton	1
Boone	1
Clark	2
Clay	2
Cleburne	5
Cleveland	2
Conway	5
Craighead	217
Crawford	5
Crittenden	1
Arkansas—Con.	
Cross	1
Desha	1
Faulkner	181
Fulton	2
Greene	4
Hot Spring	7
Howard	2
Independence	2
Izard	1
Jackson	2
Jefferson	1
Johnson	1
Arkansas—Con.	
Lawrence	2
Lee	1
Logan	2
Lonoke	3
Mississippi	6
Monroe	1
Montgomery	1
Ouachita	2
Perry	5
Phillips	2
Poinsett	1
Pope	4
Prairie	2
Pulaski	635
Randolph	2
Saint Francis	3
Saline	3
Sebastian	330
Sharp	2
Stone	1
Van Buren	1
Washington	431
White	5
Woodruff	1
Yell	3
County not specified	11
Out of State	26
Total	1, 938
California:	
Alameda	1, 950
Contra Costa	198
Fresno	1
Imperial	1
Los Angeles	38
Madera	1
Marin	5
Merced	1
Monterey	5
Napa	129
Orange	3
Sacramento	1
San Bernardino	1
San Francisco	774
San Joaquin	2
San Mateo	182
Santa Clara	447
Santa Cruz	4
Solano	86
Sonoma	2
Stanislaus	1
Sutter	1
Tulare	1
Yolo	1
Yuba	2
Out of State	45
Total	3, 882
District of Columbia:	
District of Columbia	1,223
Montgomery, Md	102
Prince Georges, Md	102
Alexandria (city), Va	36
Arlington, Va	121
Fairfax, Va	9
State not specified	2
Out of State	82
Total	1, 677
Illinois:	
Champaign	1
Cook	1, 004
DuPage	16
Kane	1
McLean	1
Madison	1
Peoria	1
Will	1
Winnebago	1
Out of State	23
Total	1, 050
Maryland:	
Anne Arundel	6
Baltimore (city)	587
Baltimore	57
Calvert	1
Cecil	1
Frederick	2
Harford	2
Howard	5
Montgomery	3
Saint Marys	1
Worcester	1
County not specified	1
Out of State	28
Total	695
New Jersey:	
Atlantic	2
Bergen	299
Burlington	8
Camden	306
Cape May	1
Essex	643
Gloucester	60
Hudson	640
Hunterdon	2
Mercer	2
Middlesex	68
Monmouth	19
Morris	9
Ocean	1

State and county	Number of women
New Jersey—Con.	
Passaic	250
Salem	3
Somerset	14
Union	193
Out of State	20
Total	2,540
North Carolina:	
Alamance	6
Alleghany	1
Anson	3
Ashe	2
Avery	1
Beaufort	3
Bladen	2
Brunswick	5
Buncombe	12
Cabarrus	2
Caldwell	1
Carteret	3
Catawba	5
Chatham	3
Cleveland	4
Columbus	16
Craven	5
Cumberland	2
Davidson	5
Davie	2
Durham	3
Edgecombe	17
North Carolina—Con.	
Forsyth	15
Franklin	3
Gaston	5
Graham	1
Granville	4
Greene	5
Guilford	713
Halifax	7
Haywood	5
Henderson	4
Hertford	1
Hoke	6
Iredell	2
Jackson	1
Johnston	2
Lee	3
Lenoir	1
Lincoln	2
Madison	2
Mecklenburg	7
Mitchell	4
Montgomery	3
Moore	4
New Hanover	6
Northampton	5
Orange	1
Perquimans	1
Person	6
Pitt	15
Randolph	7
Richmond	7
North Carolina—Con.	
Robeson	7
Rockingham	13
Rowan	5
Rutherford	1
Sampson	6
Scotland	1
Stanly	4
Surry	2
Swain	1
Tyrrell	3
Union	5
Wake	6
Watauga	1
Wayne	6
Wilkes	1
Yadkin	5
County not specified	4
Out of State	41
Total	1,066
Pennsylvania:	
Adams	1
Allegheny	1
Armstrong	2
Berks	3
Blair	370
Bradford	2
Bucks	11
Cambria	6
Pennsylvania—Con.	
Carbon	3
Centre	3
Chester	3
Clearfield	3
Columbia	1
Crawford	1
Cumberland	1
Dauphin	3
Delaware	51
Fayette	2
Franklin	1
Huntingdon	19
Jefferson	1
Juniata	1
Lancaster	1
Lebanon	2
Lehigh	4
Luzerne	6
McKean	1
Montgomery	34
Northampton	3
Northumberland	1
Philadelphia	1,235
Susquehanna	1
Washington	1
Westmoreland	2
Out of State	55
Total	1,850
Grand Total	14,698

Measuring Procedures

Equipment and Supplies

Identical calibrated measuring instruments were used by all units. The measuring costume, which was also standard throughout the project, consisted of knit cotton shorts cut high on the hips and bandeaux which fit snugly but not tightly. All garments were laundered after each wearing.

The kits of instruments and small supplies provided for each measuring squad were for the most part the same that were used in the children's measurement study. Each kit contained:

- 2 Anthropometers.
- 1 Protractor.
- 1 Sliding caliper.
- 1 2-meter steel tape.
- 4 Skin pencils.
- 1 Pocket knife or package of razor blades.
- 1 Package of pins.
- 2 Neck chains.
- 1 Steel guide rod.
- 1 Spool of twine.
- 1 Carpenter's chalk.
- 1 Manual of measurements.

Each squad was supplied with one portable leveling platform, one portable weighing scale, and the cold cream and cotton used to remove the skin pencil marks placed on the women as landmarks for measuring. Paper shoes were provided in some communities. Local arrangements were made in measuring centers for chairs, tables, and clothesracks.

The anthropometers were made from two wooden meter sticks (plate 2, *F*). These could be joined by a brass dowel and a wooden key. One carried a fixed horizontal arm at one end and a sliding horizontal arm with a reversible and tapered brass point piece. Brass triangles braced the horizontal arms at the corners. A lower brass collar which helped to hold the sliding arm perpendicular to the stick was also used to indicate readings. Metric scales were arranged on opposite sides of the anthropometer so that it could be used either to measure heights from the floor or the distance between the horizontal arms.

A protractor (plate 13, *D*) was used to measure shoulder slope. This device consisted of a revolving protractor carrying a spirit level and a wooden guide piece, which could be placed along the shoulder line so that it touched both the neck base and the armscye. When the level was set in a horizontal plane, the angle of the shoulder slope was read (in degrees) on the protractor scale.

The sliding caliper is shown in plate 2, *A*. All tapes used were steel with spring releases for rewinding. The skin pencils were of the type used in making physical examinations and the neck chains were fine-gage, small-link chains about 60 centimeters long. Knitting needles 2 millimeters in diameter and about 30 centimeters long were used as guide rods in locating some body landmarks.

When floors were uneven, leveling platforms were provided for taking height measurements. These were 2 by 3 feet, made of plyboard, and carried four setscrews and two spirit levels.

One of the portable scales supplied for weighing the women is shown in plate 2, *E*. The scales had setscrews with which the dial indicator was placed at zero before each weighing.

Measurements

The measurements and the procedures followed in taking each measurement were determined after conferences with leading pattern and garment manufacturers and retail distributors of women's clothing. The schedule included weight and 58 measurements. Of these, 54 were taken with the subject wearing only the measuring costume. If she customarily wore a foundation garment, she was then asked to put it on, and 4 of the trunk-girth measurements were retaken. The complete list of measurements included those used in constructing all garments except shoes, hats, and gloves. These were omitted because it was found to be impractical to take so many measurements at one time.

The measurements taken on each woman are listed below in the order in which they are considered in the analysis of the data. This order differs somewhat from the one in which they appeared on the schedule (p. 24). With the exceptions noted, all measurements were metric and were recorded in centimeters to the nearest millimeter.

1. Weight (in pounds).

Vertical measurements:

2. Stature.
3. Cervicale height.
4. Bust height.
5. Waist height.
6. Abdominal-extension height.
7. Hip height.
8. Sitting-spread height.
9. Crotch height.
10. Tibiale height.

Vertical measurements—Con

11. Ankle height.
12. Total posterior arm length.
13. Upper posterior arm length.
14. Anterior arm length.
15. Sitting height.
16. Vertical trunk girth.
17. Cervicale to waist anterior.
18. Anterior waist length.

Vertical measurements—Con.

19. Shoulder to waist.
20. Neck to bust.
21. Posterior waist length.
22. Seye depth.
23. Trunk line.
24. Arm length, shoulder to seye.
25. Waist to hip.
26. Total crotch length.
27. Anterior crotch length.

Horizontal measurements:

28. Chest girth at armseye.
29. Bust girth.
30. Waist girth.
31. Abdominal-extension girth.
32. Hip girth.
33. Sitting-spread girth.
34. Maximum thigh girth.
35. Midway thigh girth.
36. Bent knee girth.
37. Knee girth at tibiale.
38. Maximum calf girth.
39. Minimum leg girth.
40. Ankle girth.
41. Neck-base girth.
42. Armseye girth.

Horizontal measurements—Continued.

43. Upper-arm girth.
44. Elbow girth.
45. Forearm girth.
46. Wrist girth.
47. Shoulder length.
48. Anterior chest width.
49. Highest bust-level width.
50. Posterior chest width.
51. Anterior bust arc.
52. Anterior waist arc.
53. Abdominal-extension arc.
54. Posterior hip arc.
55. Bust girth over foundation garment.
56. Waist girth over foundation garment.
57. Abdominal-extension girth over foundation garment.
58. Hip girth over foundation garment.

Angle measurement (in degrees):

59. Shoulder slope.

Training Schools for Measurers

Training schools of 2 to 3 weeks duration were held for measurers in all communities in which data were collected. Ten such schools were conducted from which 144 women were certified as measurers. Women models with various types of figures were used for demonstration and practice in the measuring procedures. Each trainee had an opportunity to work with each model.

A manual of measurements described in detail the placing of the necessary landmarks on the body and the methods to be followed in taking measurements. This manual was supplied to each measurer for use as a reference book during the training school and in the field work.

Before beginning the training, the anthropometrist and the assistants who were to conduct the training schools and supervise the units worked out the detailed technique of the measuring and perfected their own techniques until they could duplicate their measurements on one subject within the tolerance agreed upon for each measurement.

At the end of each training school, either the anthropometrist in charge or one assistant assigned to this duty tested each measurer by making duplicate measurements on the same model. Each measurer also made duplicate measurements on each of the models provided for the training school. These previously had been measured by the instructors. Thus an additional check was obtained on each measurer. Only those giving satisfactory evidence of accurate work were allowed to start measuring.

During the training schools, instructions were also given for filling out the schedules, proper care of the instruments, and arrangements of the measuring centers. In the interest of maintaining cordial public relations, personal conduct was also given proper attention.

Placement of Body Landmarks

As a first step in the measuring procedure certain marks were placed with a skin pencil on the body of the subject. When possible, the marks were located with reference to definite points of the skeleton (figs. 1, 2, and 3). Small crosses were marked in most places because the intersection of two lines was more satisfactory than a dot as a measuring point (pl. 1, *A*, *B*, *C*). The methods used in determining and placing the landmarks are given below. The landmarks are grouped according to their position on the body although, in measuring, an order that permitted greater speed was used.

Landmarks of the Neck.

The neck base.—The curve of the neck base was determined by first placing three landmarks, one each on the cervicale and upper borders of the medial extremities of the right and left clavicles (pl. 1, *A* and *C*). The neck chain was then placed around the neck so that it passed over the cervicale and touched the two anterior landmarks. The position is shown in plate 1, *D*. While the chain was in place, its position was marked in the center front and over the trapezius muscle on the right side. A short vertical line intersecting the neck base at the center front was drawn in the median sagittal plane. The cross at the cervicale was placed in the center of the spinous process of the seventh cervical vertebra. This is usually most prominent when the head is dropped forward. It was, therefore, palpated when the head was in this position, but the landmark was marked when the skin was in its normal position with the head erect.

Landmarks of the Trunk.

The armseye.—The armseye, the line followed by the seam of a typical set-in sleeve, is an important line in clothing construction. It was marked by four landmarks, i. e., the shoulder point, the armseye anterior and posterior, and underarm midpoint. The procedure, described here for the right side only, was identical for the right and left sides.

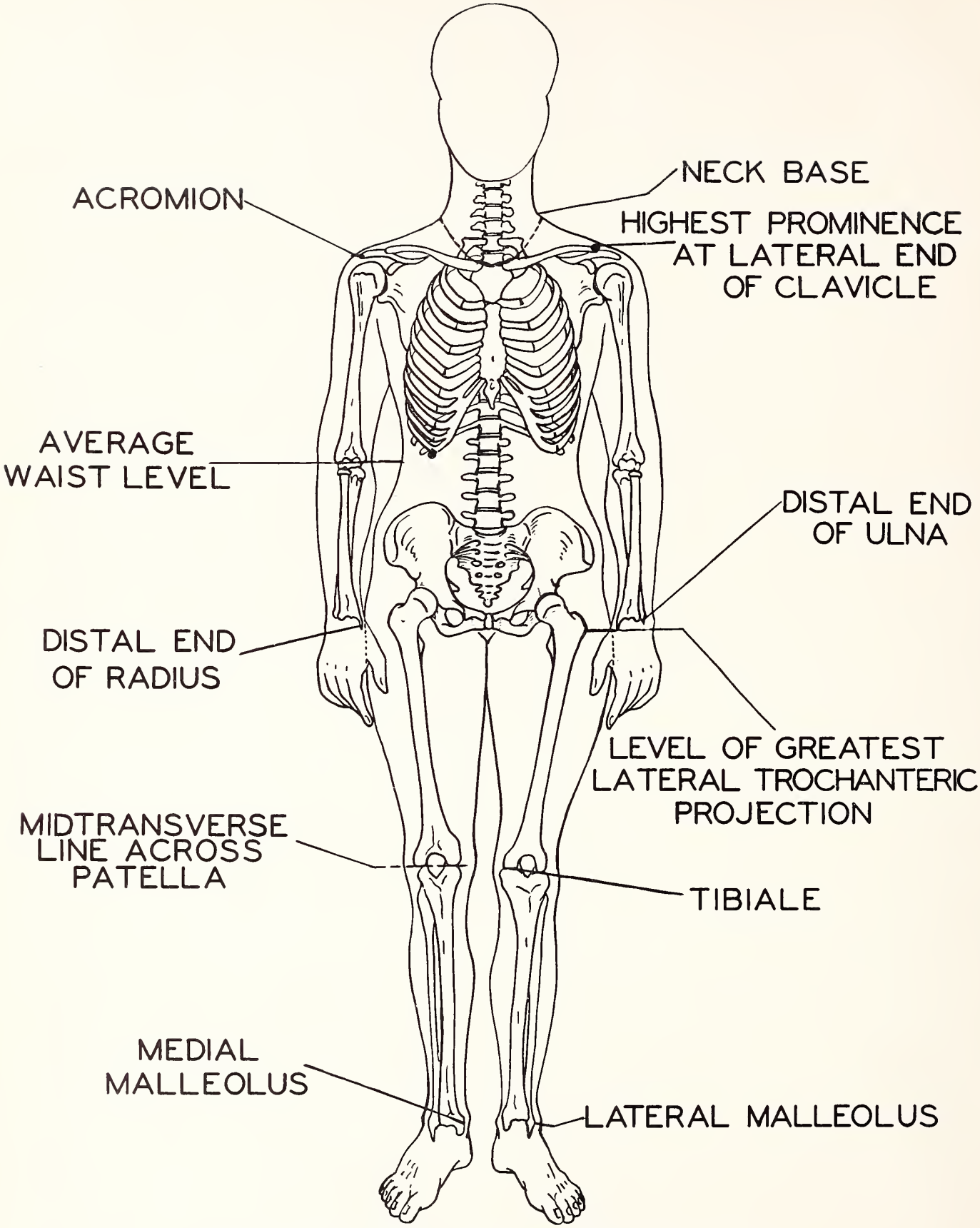

FIGURE 1.—Anatomical points used in locating body landmarks. Front view.

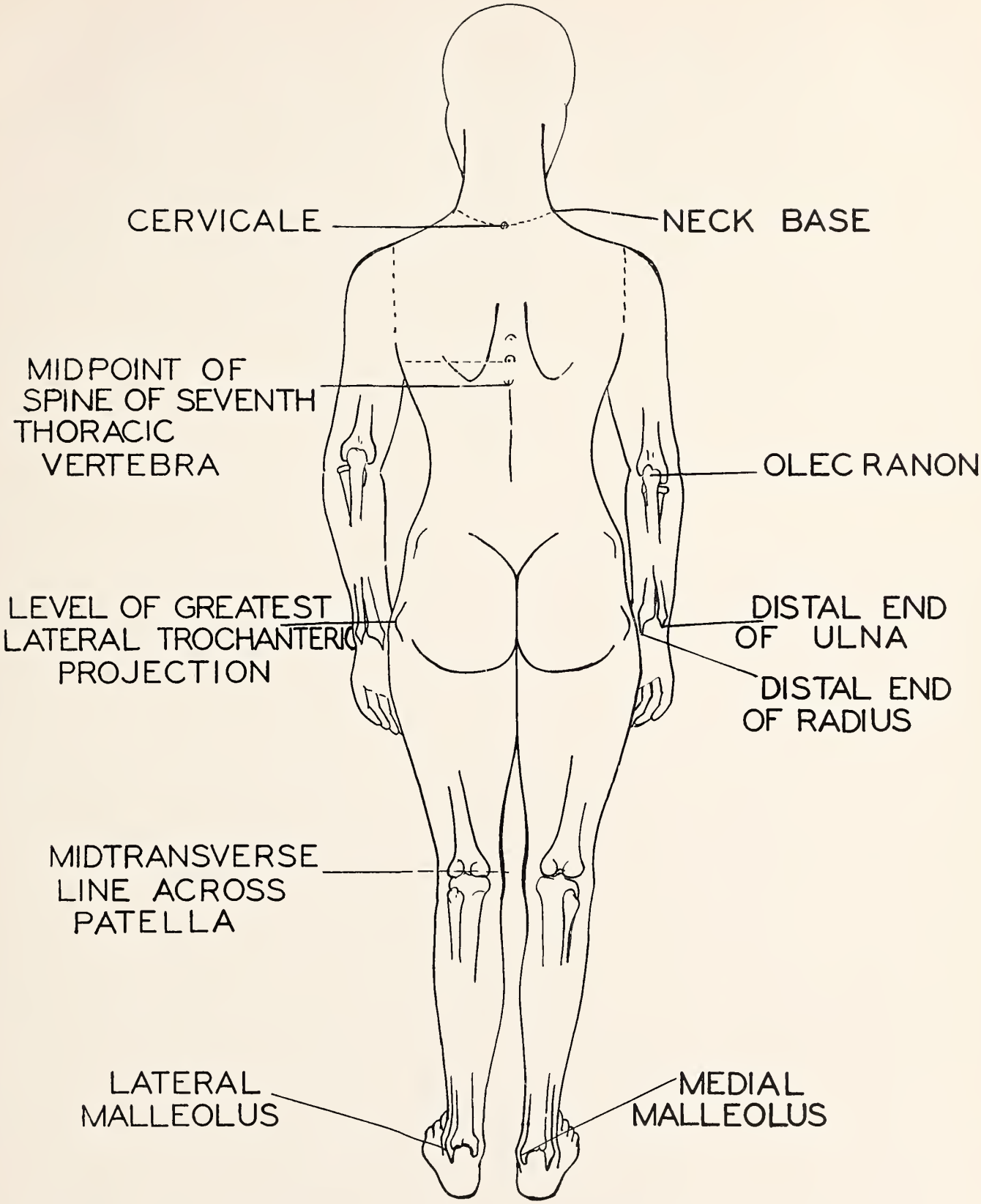

FIGURE 2.—Anatomical points used in locating body landmarks. Back view.

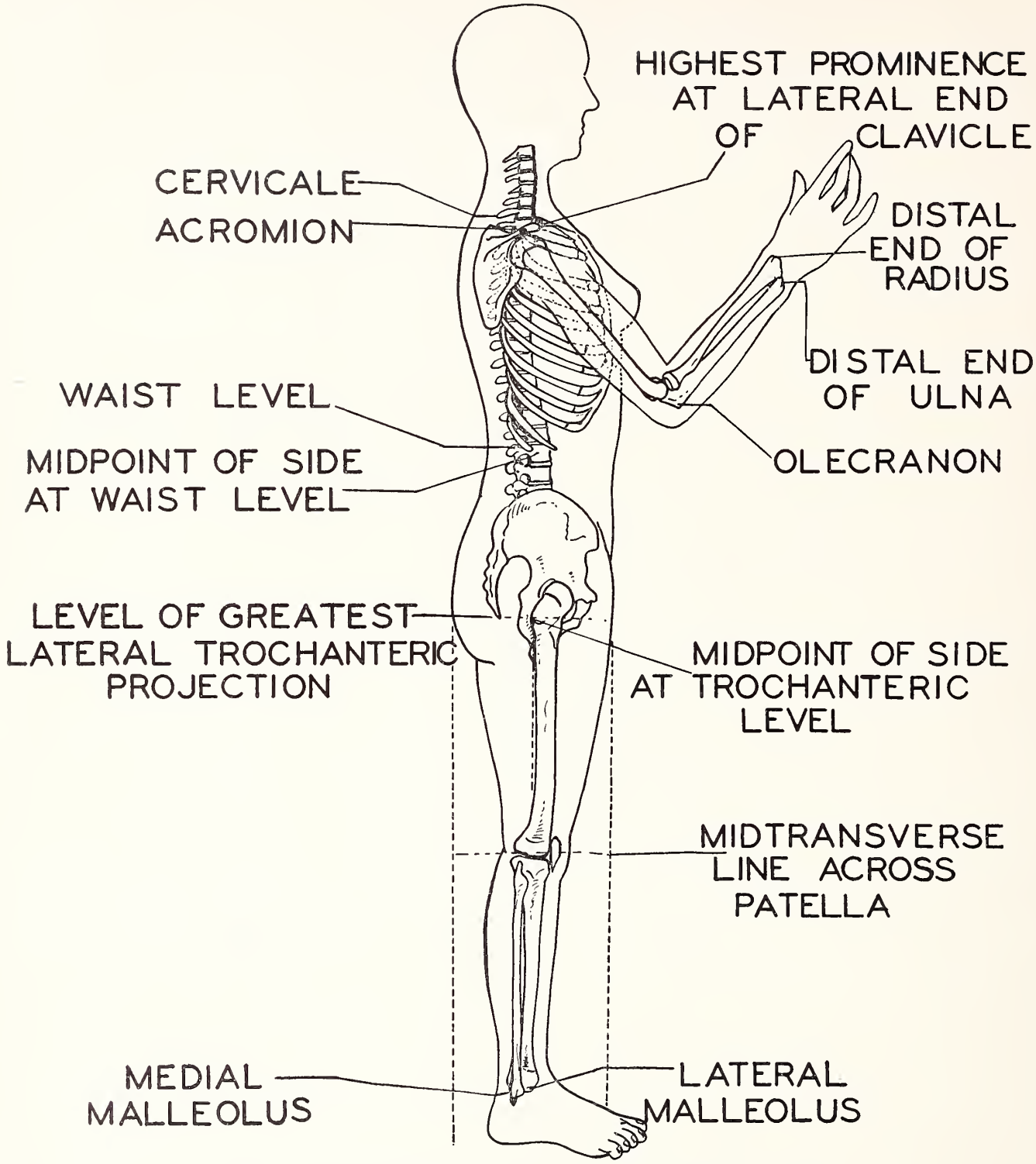

FIGURE 3.—Anatomical points used in locating body landmarks. Side view.

The shoulder point used was midway between the acromion and the highest point at the lateral end of the clavicle (pl. 1, *E*). The acromion as defined for this purpose was a point on the side of the acromial process midway between a point in front of the angle of the process and a point at the center of the shoulder as judged by sighting. The first step in establishing it was to outline the side of the acromial process (pl. 1, *E*). Points were then placed on the outline at the angle of the process and at the sighted center of the shoulder. A line intersecting the outline of the process was placed midway between these two points and the intersection marked as the acromion. This use of the midpoint between two easily located limits made it easier to find the most lateral point of the process.

The highest point at the lateral end of the clavicle was then located and marked. The point midway between this and the acromion was marked as the shoulder point of the armscye.

The armscye anterior and posterior were traced with the aid of a small string covered with carpenter's chalk. The center of the string was placed under the arm when the arm was raised about 30° from the trunk. The ends of the string were brought up and crossed over the shoulder point, thus indicating the direction of the armscye at the front and back as well as under the arm. The chalked path of the string was marked as shown in plate 1, *A* and *C*, using short, thin, sloping lines. The lines were placed on the front and back of each shoulder and on the top of the right shoulder but not under the arm. On the front and back they were located so as to serve as zero and reading points at the level of the fourth thoracic vertebra and the level of the mid-armscye region, respectively.

The underarm midpoint was placed with reference to the natural folds in the armpit and the total width of the shoulder. The height of the midpoint in the armpit was decided on the basis of the size and position of the folds. The measurer sat in front of the subject and studied the formation of the folds on the right and left sides as the arms were raised to about 45° and gradually lowered to meet the trunk. Usually the folds of one armpit are more clearly defined than those of the other. The level of the midpoint was set with respect to the more clearly defined folds and a corresponding level marked off in the pit of the arm on the opposite side. A short, thin line on the trunk marked the underarmscye level.

A vertical line indicating half of the total width of the shoulder was drawn through this to give the underarm midpoint of the trunk. This bisection of the shoulder was made with a small caliper (pl. 2, *A*). The subject's arm was raised to the side at an angle of approximately 90° with as little elevation of the shoulder as possible. The upper edge of the shaft of the caliper was held against the trunk at the level of the armscye, the shaft horizontal, and the jaws in a vertical position, touching the shoulder at the back and front without constricting it. The midpoint of the total width was then marked with the skin pencil.

The underarm midpoint on the arm was placed so that it fell upon the midpoint of the trunk when the arm was lowered to the side. This was determined by trial placements and readjustments when the arm was alternately raised and lowered.

The position of these underarm midpoints on the trunk and arm took clothing construction into account. The measurer had to decide to what height under the arm the blouse could extend without forming an uncomfortable surplus of fabric when the arm was lowered. This depended upon the position of the armpit folds on the subject being measured.

Plates 1, *B* and 2, *C* show the midpoints marked on both trunk and arm.

The shoulder line.—A line was marked corresponding to the customary shoulder seam of a garment. It was located with reference to the trapezius muscle and the acromion, intersecting the neck base and the armscye at the shoulder (pl. 1, *E*). By palpation at the neck base, it was possible to find the border of the upper fibers of the trapezius which pass forward and downward to become inserted in the acromial end of the clavicle. The intersection of the shoulder line with the neck base was placed at this front border of the trapezius. The other end of the shoulder line was directed by the acromion, although the intersection of the shoulder line was actually with the armscye. The steel guide rod was used to guide the measurer so that the neck base and armscye intersections could be readily placed with respect to the trapezius border and the acromion.

Level for the measurement of waist girth.—The waist level used lies at the lower edge of the lowest rib and was found by palpating the sides of the body in the midaxillary line. This waist level corresponds very closely to the natural waist which can be seen when the side profiles of the body are slightly concave.

To locate the waist level, the measurer sat in front of the subject and felt the right and left sides simultaneously, using the index fingers to press against the sides in line with the armpits. The hands were held with the palms directed toward the floor and the fingers extended and together. The thumb side of the middle joint of the index finger was placed against the subject. When the lower edge of the lowest rib was felt on the back

surface of the index finger, the level of the midline of the index finger was taken as the waist level. Without displacing the skin, the level was marked with a dot in line with the armpit on the right and left sides in turn. The waist levels of the right and left sides frequently differ. The average height from the floor of the two sides was therefore considered the waist level. The anthropometer was set at this height and landmarks for the average waist level placed at the center front, at the center back, and in line with the greatest prominence of the right breast (pl. 1, *A*, *B*, and *C*).

The finished landmarks of the waist were five in number: center back, center front, each side, and the right side of the front. Small crosses were used at center back, front, and sides, composed of two short, straight, thin lines at right angles, similar to those at neck base and cervicale. The horizontal branches indicated average height of waist. At center back and front the vertical intersecting lines were in the median sagittal plane. The vertical intersecting line at the side was a projection of a bisection at hip level of an imaginary "panel" defined by the buttocks and the thigh. This "panel" is discussed more fully under "Level for the measurement of hip girth" (see below).

Level for the measurement of the greatest abdominal extension below the waist.—The region of the abdomen below the waist was viewed from the side and a landmark placed at the level of greatest protuberence. The height of this landmark from the floor was measured with the anthropometer and additional landmarks placed at this level on both sides and at the center back.

Level for the measurement of width of chest.—Short, straight, thin lines were used to mark on the back and chest the levels at which the widths between the armscyes were to be measured. On the back, the landmark was placed in the center on the prominence of the spinous process of the seventh thoracic vertebra. The landmark on the chest was placed at a level midway between that of the shoulder point of the armscye and the level of the lowest visible point of the armscye (pls. 1, *C* and 2, *B*). The latter point was indicated by placing a pencil under the arm so that the blunt end was visible at the juncture of the arm and trunk.

Level for the measurement of maximum bust girth.—To guide the measurer in placing her tape at the level at which the girth of bust appeared to be greatest, landmarks were placed at this level after consideration of the contour of the bust. The region of the bust was viewed from one side and a preliminary landmark was placed at the level at which it appeared that the girth would be the greatest. Similarly a preliminary landmark was placed when the subject was viewed from the opposite side. The average height of the two preliminary landmarks was taken as the level of maximum bust girth. The final landmarks were placed at the center front, center back, and the right and left sides (pl. 1, *A*, *B*, and *C*).

Landmarks of the Upper Extremity.

Bisection of upper arm.—The length of the upper section of the arm from the shoulder to a point on a level with the armscye is used in sleeve construction (the sleeve cap). The width of the upper arm was bisected, by sighting between the guide rod and a pencil held at armscye level at the front and back of the arm perpendicular to the floor. A short line was drawn indicating this bisection approximately at armscye level (pl. 5, *D*).

Elbow, right.—The length of the upper segment of the arm was measured from the armscye-shoulder line intersection to the elbow. In order to provide a landmark at the elbow, the closed fist of the subject was rested against the waist with the back of the hand facing forward; the most lateral point of the olecranon was then located and marked.

Wrist, right.—The total length of the arm was measured from the armscye-shoulder line intersection over the elbow to the farther (distal) end of the ulna at the wrist. To locate the end of the ulna, the flat of the thumb nail of the measurer was pushed up against the end of the ulna on the same side as the little finger and its distal end indicated by a short line drawn perpendicular to the long axis of the ulna. An intersecting line was placed at right angles to this in the middle of the side of the wrist corresponding to the little finger.

Midanterior wrist point.—The reading point for the measurement of the anterior length of the arm was placed on the anterior or volar surface of the wrist. This was a sighted projection of the distal end of the ulna.

Landmarks of the Lower Extremities.

Level for the measurement of hip girth.—The level of the hip was placed at the most prominent bony point in the region of the trochanter major. The level was determined independently for the right and left sides and the average of the two taken as the hip level. The preliminary landmarks were corrected to correspond with the average if the difference between the two sides exceeded 4 millimeters.

The extended index and middle fingers of the measurer's right hand were used to palpate the region of the trochanter. This was done while the measurer squatted with her eyes approximately at the level

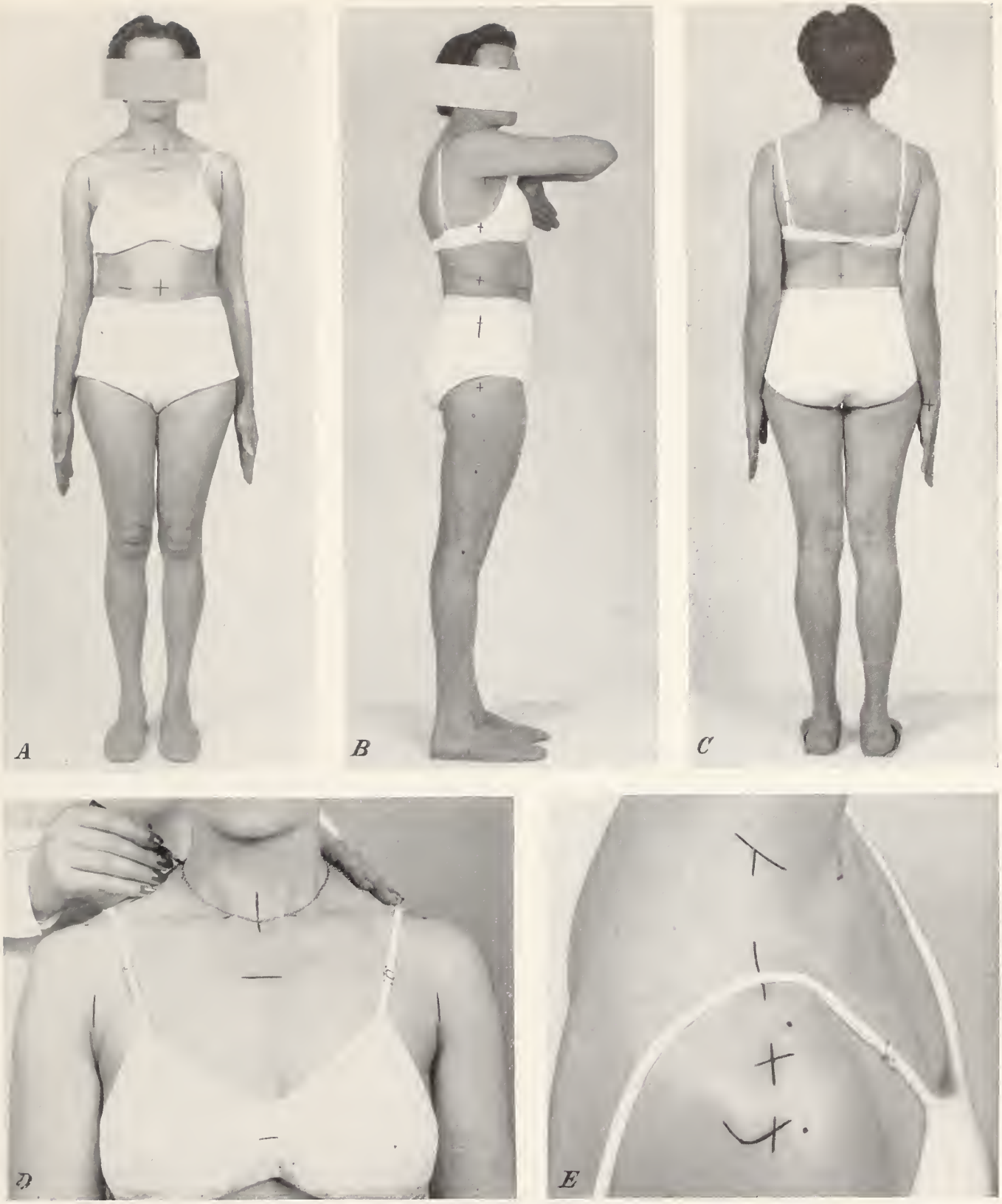

Plate 1.—*A*, Landmarks placed on the front of the body; *B*, landmarks placed on the side of the body; *C*, landmarks placed on the back of the body; *D*, position of neck chain to indicate the curve of the neck base. It passes over the seventh cervical vertebra and the medial extremities of the clavicles. *E*, Landmarks used in locating the shoulder point of the armseye.

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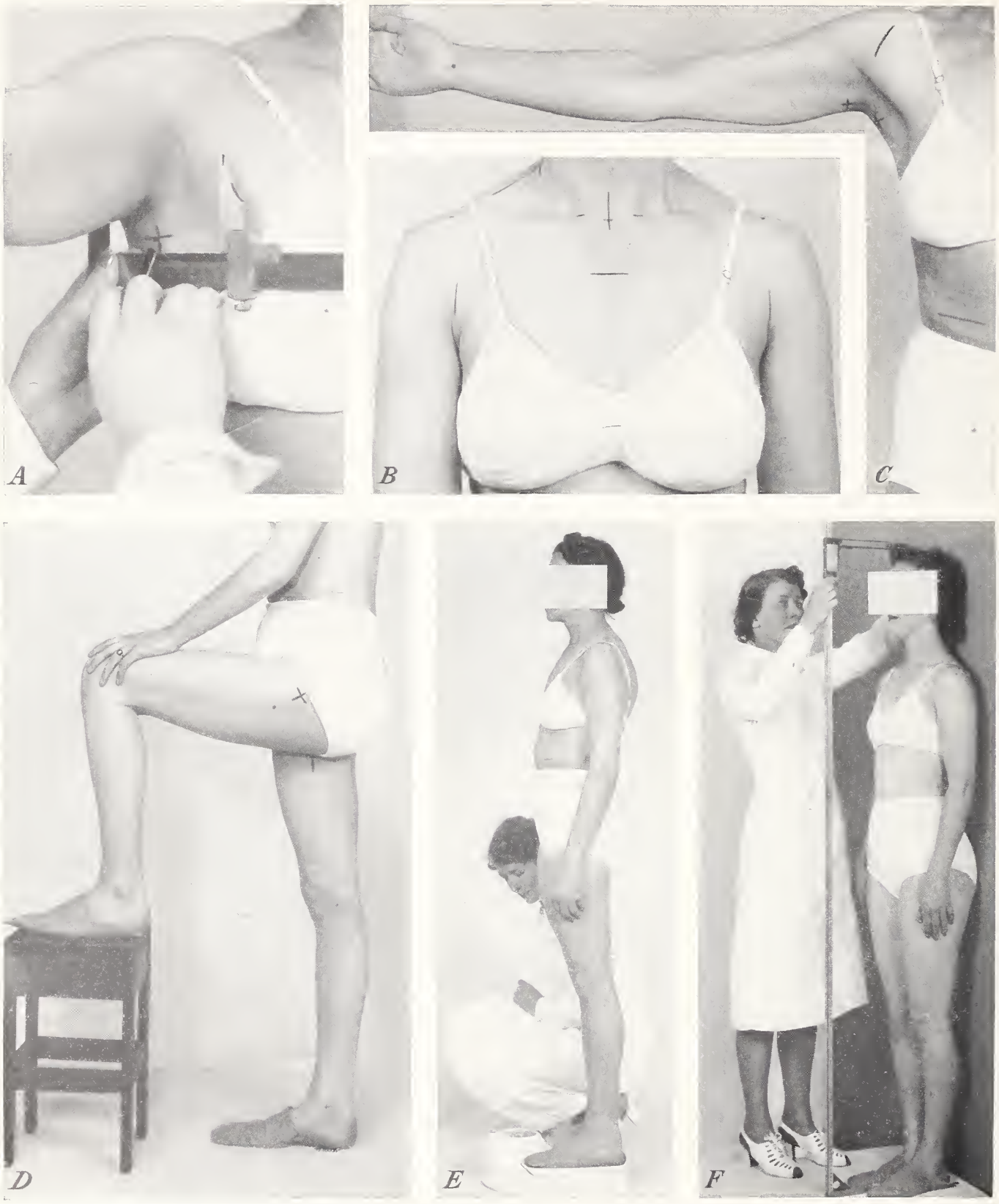

Plate 2.—*A*, Bisection of the shoulder to obtain the underarm midpoint; *B*, landmarks on the front of the upper portion of the trunk; *C*, underarm midpoints marked on trunk and arm; *D*, landmarks at waist, hip, crotch, tibiale, and ankle; *E*, taking the weight; *F*, measuring stature.

of the trochanter. The direction of the palpation was from below upward. On well-developed, muscular women or on those with excessive fat pads, it took some time to find the proper level. It was often necessary to ask the subject to bend slightly forward or rotate the femur by turning the toes laterally and by pivoting on the heel. A rounded region was thus located, the midpoint of which was marked with a preliminary dot to indicate the hip level. The average hip level was later marked with a short horizontal line.

A point was determined on this line, corresponding to the location of the side seam of a garment. The measurer located the point by squatting at the side of the subject with eyes at the hip level and holding the guide rod and skin pencil tangent to the buttocks and thigh profiles, respectively, at their most projected parts. The midpoint between these two was sighted and marked on the hip-level line. The measurer was helped by thinking of this as bisecting a hypothetical vertical "panel," the posterior limit of which was tangent to the most posterior projection of the buttocks and the anterior limit of which was tangent to the most anterior projection of the thigh. When this point was set, the steel guide rod was held vertically and used as a ruler to extend the line from this point to the waist level (see "Level for the measurement of waist girth" (p. 9)). The point where it met the waist level was marked (pl. 1, *B*). By this means a line was produced following the usual direction of the side hip seams of clothing.

Level for the measurement of sitting spread.—The level of sitting spread was defined as the most lateral extension of the thighs when the subject sat relaxed on a table with knees snug against the edge and the feet hanging. The trunk was kept at right angles to the table. Preliminary landmarks on the side of each thigh were sighted and placed. The subject was then asked to stand, and the anthropometer was used to check the two levels from the floor. If the difference between the two sides exceeded 4 millimeters the landmarks were corrected to correspond to the average (pl. 1, *B*).

Crotch center.—This landmark corresponds to the intersection of the inside seams of trouser legs with the crotch seams. The subject rested her left foot on a chair while the landmark was placed (pl. 2, *D*). The measurer squatted at the side of the subject with her eyes at the level of the gluteal fold and directly in front of the inner surface of the right thigh. The subject's right foot was directed straight forward. The middle line of the inner surface of the right thigh was sighted and marked with a thin vertical line extending downward from the perineum (pl. 2, *D*). If the lower borders of the measuring suit obscured the region, the subject was asked to draw them up by lifting the suit by the waist band.

Tibiale, right.—The tibiale was taken as the highest point on the margin of the glenoid of the tibia when the subject stood erect. The medial "cleft" of articulation between the condyles of the femur and the upper end of the tibia was used as a guide in locating this. It was palpated by grasping the knee firmly while it was alternately flexed and extended and by moving the index finger or thumb in the region of the "cleft" until the ends of the bones were located. The tibiale was marked by a dot (pl. 2, *D*) at the level of the cleft.

Median line of kneecap (patella) with knee bent.—A horizontal line was placed midway between the upper and lower borders of the patella (pl. 1, *A*). This landmark was located while the knee formed a right angle.

Ankle point (malleolus medialis).—The ankle point is the middle point of the malleolus medialis at the lower extremity of the tibia. It is most prominent on the inner side of the ankle (pl. 2, *D*) and is easily identified by palpation.

Landmarks over Foundation Garment.

After the body measurements were taken (p. 12), the subject put on the foundation garment she had worn to the measuring center. The landmarks listed below were marked on the garment by pins.

Level for the measurement of bust girth over foundation garment.—The movable arm of the anthropometer was set at the average bust height as determined by measurement No. 4 (p. 12). With the anthropometer perpendicular to the floor, landmarks were indicated by placing pins on the foundation garment, marking back, front, and right and left sides at the previously determined bust level.

Level for the measurement of waist girth over foundation garment.—The movable arm of the anthropometer was set at the average waist height as determined by measurement No. 5 (p. 12). With the anthropometer perpendicular to the floor, landmarks were indicated by placing pins on the foundation garment, marking the back, front, and right and left sides at the previously determined average waist level.

Level for the measurement of maximum abdominal extension girth over foundation garment.—The movable arm of the anthropometer was set at the average height of the greatest abdominal extension below the waist as determined by measurement No. 6 (p. 12). With the anthropometer perpendicular to the floor, landmarks were indicated by placing pins on the foundation garment, marking the back, front, and

right and left sides at the previously determined average abdominal-extension level.

Level for the measurement of hip girth over foundation garment.—The movable arm of the anthropometer was set at the average height of hip as determined by measurement No. 7 (p. 13). With the anthropometer perpendicular to the floor, landmarks were indicated by placing pins on the foundation garment, marking the right and left sides at the previously determined average hip level.

Taking Measurements

After all the landmarks had been placed on the body, the measurements were taken, according to the procedures described below:

1. Weight (pl. 2, E):

Instrument.—Portable scales.

Position of subject.—The subject was asked to stand quietly on the center of the platform of the scales.

Procedure.—The dial indicator was set at zero before the subject stepped on the scales. The subject was instructed not to shift her weight while the reading was made.

2. Stature (pl. 2, F):

Instruments.—Anthropometer. A leveling platform was used if the floor was not level. A perpendicular wallboard was also used when a suitable wall, free of baseboard and paneling, was not available in the workroom.

Position of subject.—The subject stood erect with feet as close together as was comfortable and with the palms of the hands on the thighs. The eyes were directed forward. Reid's base line (the line from just above the tragus to the base line of the eye socket) was held parallel to the floor while, with the weight well over the feet, the subject stepped slowly backward until some part of her body touched the wall. She remained in this position while the measurement was being taken.

Position of measurer.—The measurer stood at the subject's right side.

Procedure.—The anthropometer was held and balanced in a vertical position in the measurer's right hand. The left hand located the vertex of the head while the right hand slid the moving arm of the anthropometer down to rest there. The hair texture was taken into consideration when exploring the top of the head, and sufficient pressure was used to bring the brass point piece of the anthropometer to the level of the vertex. The anthropometer was then carefully removed from the subject and read with the eyes on the level of the reading.

3. Cervicale height (pl. 3, A):

Landmark.—Cervicale.

Instruments.—Anthropometer. The leveling platform was used if the floor of the workroom was not level.

Position of subject.—The position of the subject was normal, nonfatigue, away from the wall so that the anthropometer could be placed back of her. The eyes were directed forward and the head held erect. The palms of the hands were placed on the thighs.

Position of measurer.—The measurer stood back of the subject, slightly to her left side.

Procedure.—The anthropometer was held vertical in the right hand in line with the center back. The straight edge of the brass-point piece was directed toward the floor. The point was lowered to the cervicale.

4. Bust height (pl. 3, B).—This measurement was the average height of the preliminary landmarks placed on the bust. It was recorded when the preliminary landmarks were measured preparatory to placement of the four landmarks of average bust level described under Landmarks of the Trunk.

Instruments.—Anthropometer. The leveling platform was used if the floor of the workroom was not level.

Position of subject.—The subject stood erect.

Position of measurer.—The measurer stood in front of the subject.

Procedure.—The anthropometer was held vertical in the right hand and the moving arm lowered with the left until the brass point was on the landmark.

5. Waist height (pl. 3, C).—This measurement was the average height of the preliminary landmarks on the right and left sides of the waist in the midaxillary region at the margin of the lowest rib. It was recorded when the preliminary landmarks were measured preparatory to placing the five landmarks of the average waist level described under Landmarks of the Trunk.

Instruments.—Anthropometer. The leveling platform was used if the floor of the workroom was not level.

Position of subject.—The subject stood erect. She was cautioned against shifting her weight from one foot to the other and from heels to toes. Her arms hung loosely at the sides, slightly to the back.

Position of measurer.—The measurer stood facing each landmark as placed.

Procedure.—The anthropometer was held vertical in the right hand and the moving arm lowered with the left until the brass point rested on the landmark.

6. Abdominal-extension height (pl. 3, D).—This measurement was taken when the appropriate land-

Plate 3.—*A*, Measuring height of cervicale; *B*, measuring height of maximum girth of the bust; *C*, measuring height of waist; *D*, measuring the height of the greatest extension of the abdomen; *E*, measuring the hip height; *F*, measuring height of the greatest extension of the thighs when the subject is sitting.

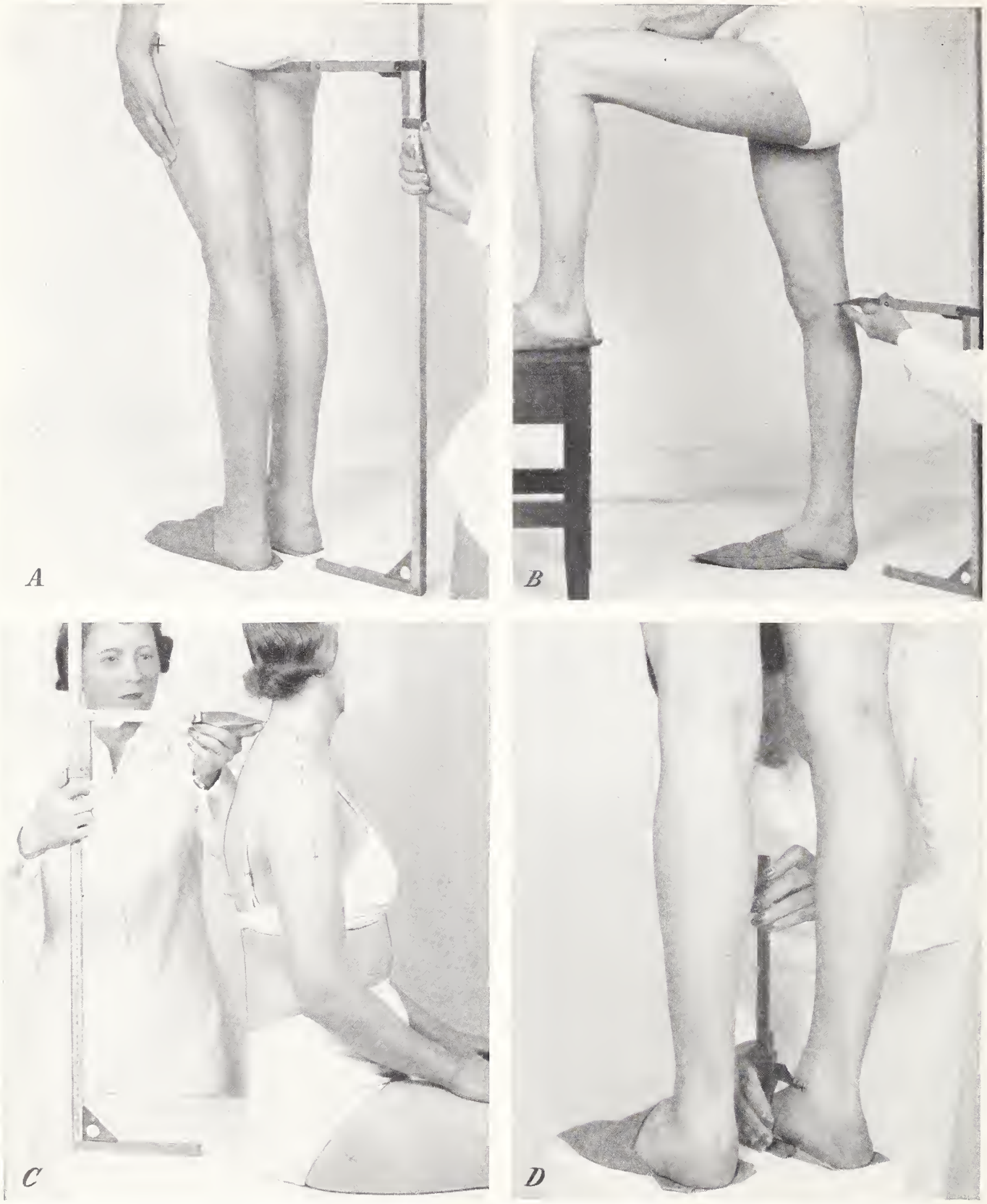

Plate 4.—*A*, Measuring height of crotch; *B*, measuring height of tibiale; *C*, measuring the sitting height; *D*, the position of the caliper during the measurement of the height of ankle.

marks were placed (see Landmarks of the Trunk).

Instruments.—Anthropometer. The leveling platform was used when the floor was not level.

Position of subject.—The subject stood erect, the palms of the hands at the thighs, with her weight evenly distributed on her feet.

Position of measurer.—The measurer sat in front of the subject.

Procedure.—The anthropometer was held vertical in the right hand and the movable arm raised with the left until the brass point rested on the landmark.

7. Hip height (pl. 3, E).—The average height of the preliminary landmarks placed on the right and left sides in the region of the trochanters was recorded as the height of hips.

Instruments.—Anthropometer. The leveling platform was used if the floor of the workroom was not level.

Position of subject.—The subject stood erect, with her hands on her hips and her weight evenly distributed on her feet.

Position of measurer.—The measurer usually found it most convenient to sit in front of the subject.

Procedure.—The anthropometer was held in the right hand, and the movable arm raised with the left until the brass point rested on the landmark.

8. Sitting-spread height (pl. 3, F).—The average height of the preliminary landmarks indicating the greatest extension of the thighs, right and left, when the subject was sitting, was recorded. (See Landmarks of the Trunk.)

Instruments. Anthropometer. The leveling platform was used when the floor was not level.

Position of subject.—The subject stood erect, with hands on her hips and her weight evenly distributed on her feet. She was cautioned against shifting her weight from one foot to the other or from heels to toes.

Position of measurer.—The measurer sat in front of the subject.

Procedure.—The anthropometer was held in the right hand and the movable arm raised with the left until the brass point rested on the landmark.

9. Crotch height (pl. 4, A):

Landmark.—Crotch center.

Instruments.—Anthropometer. The leveling platform was used if the workroom floor was not level.

Position of subject.—The subject stood erect in a normal, nonfatigue position.

Position of measurer.—The measurer squatted directly back of the subject with her eyes at the level of the gluteal fold.

Procedure.—The subject was asked to pull up the measuring suit by the waist band. The anthropometer was held in the right hand and the movable arm raised with the left until the brass point rested on the landmark.

10. Tibiale height (pl. 4, B):

Landmark.—Tibiale.

Instruments.—Anthropometer. The leveling platform was used when the floor of the workroom was not level.

Position of subject.—The subject placed her left foot on a chair, which raised it to the level of the midregion of the patella. She was asked to keep her weight distributed as evenly as possible on her feet, and the main axis of her right leg perpendicular to the floor. The right foot was directed straight forward.

Position of measurer.—The measurer squatted at the subject's left side, with her eyes at the knee level of the subject.

Procedure.—The anthropometer was held in the right hand and its movable arm raised until the brass point rested upon the landmark. This height was then marked with the skin pencil on the lateral surface of the right knee for use in taking measurement No. 35.

11. Ankle height (pl. 4, D):

Landmark.—Most medial point of the malleolus medialis.

Instruments.—Sliding caliper. The leveling platform was used when the floor was not level.

Position of subject.—The subject stood in a normal, nonfatigue position with her feet 6 to 8 inches apart and her weight evenly distributed on them.

Position of measurer.—The measurer knelt or squatted on the side of the subject, getting the eyes as near the level of the ankle as possible.

Procedure.—The sliding caliper was placed between the feet of the subject with its shaft vertical and resting on its fixed arm. The movable arm was raised until the lower edge touched the landmark. The reading was taken on the lower hair line and recorded with the notation "plus 1.8." This correction (later made during the editing of the schedules) was necessitated by the lack of calibration on the fixed arm.

12. Total posterior arm length, right (pl. 5, B):

Landmarks.—Armseye-shoulder line intersection, olecranon, and the distal limit of the ulna.

Instrument.—Tape.

Position of subject.—The subject stood with normal, erect posture, feet together. Her clenched right fist was placed on her hip with the back side of the hand to the front. The arm was not flexed at the wrist.

Position of measurer.—The measurer stood on the right side, slightly back of the subject. When reading the tape, the measurer bent down under the point

at the wrist so that the reading was made in the direct line of vision.

Procedure.—The zero point of the tape was placed at the armscye-shoulder line intersection. The tape was passed over the olecranon to the landmark at the distal limit of the ulna. The measurement was taken with sufficient tension to prevent the tape from slipping off the olecranon.

13. Upper posterior arm length, right (pl. 5, C):

Landmarks.—Armscye-shoulder line intersection and the olecranon.

Instrument.—Tape.

Position of subject.—Identical to that assumed for measurement No. 12.

Position of measurer.—The measurer stood back of the subject's right arm.

Procedure.—The zero point of the tape was held at the armscye-shoulder line intersection. The reading was made at the olecranon.

14. Anterior arm length (pl. 5, A):

Landmarks.—Underarm midpoint on the arm and the midanterior wrist point.

Instrument.—Tape.

Position of subject.—The subject assumed her normal erect posture with feet together. Her right arm was raised laterally about 30° without elevating the shoulder. The fingers were extended and the palm of the hand directed toward her thigh.

Position of measurer.—The measurer sat at the right side of the subject so that both landmarks could be observed.

Procedure.—The zero point of the tape was placed at the underarm midpoint on the arm. The reading was made at the midanterior wrist point.

15. Sitting height (pl. 4, C):

Landmark.—Cervicale.

Instrument.—Anthropometer.

Position of subject.—The subject sat erect on a table with her knees snug against the edge and her hands in her lap.

Position of measurer.—The measurer stood at the left side of the subject.

Procedure.—The anthropometer was held perpendicular to the table, at the center back of the subject. The movable arm was raised to the cervicale and the measurement read.

16. Vertical trunk girth (pl. 5, D):

Landmark.—Center of right shoulder, midway between the intersections of the neck base and the armscye with the shoulder line.

Instrument.—Tape.

Position of subject.—The subject stood in her normal erect position with her feet a few inches apart so that the tape could pass freely between the thighs. She was asked to pull the measuring garment up snugly by the waist band.

Position of measurer.—The measurer stood in front of the subject with her eyes at bust level.

Procedure.—The tape was drawn out about 1 meter. The zero end was passed between the ankles and brought up over the right shoulder to meet the other tape end which was brought up from the crotch over the largest projection of the right breast. On the shoulder, the tape lay midway between the neck base and the armscye. Posteriorly, at the crotch, the tape passed between the buttocks; anteriorly, it passed centrally over the genitals without constriction. The feet were placed together after the tape was set. Since the breathing of the subject affected the measurement, the middle value between the largest and smallest reading was recorded.

17. Cervicale to waist, anterior (pl. 5, E and F):

Landmarks.—Cervicale, average waist level at center front and intersection of shoulder line and neck base.

Instrument.—Tape.

Position of subject.—The subject stood in her normal, erect position.

Position of measurer.—The measurer stood to the right side of the front of the subject.

Procedure.—The zero point of the tape was placed on the cervicale. The tape was then guided along the right side of the neck base to the shoulder-line intersection. From this point it was allowed to follow the contour of the body to the waist level at center front, where the reading was taken.

18. Anterior waist length (pl. 6, A):

Landmarks.—Neck base and average waist level at center front.

Instrument.—Tape.

Position of subject.—The subject was asked to assume the same position as when her stature was measured (measurement No. 2) and maintain it while this measurement, as well as measurements No. 21, No. 48, and No. 50 were taken successively. Special care was taken that the subject's posture did not change during these four measurements.

Position of measurer.—The measurer stood in front of the subject, slightly to her right side.

Procedure.—The zero point of the tape was held at the neck base in the center front and the reading made at the average waist level. The subject was cautioned not to raise the chin when the zero point of the tape was placed at the neck base.

19. Shoulder to waist (pl. 6, B):

Landmarks.—Shoulder line, level of greatest prominence of the bust, and average waist level.

Instrument.—Tape.

Plate 5.—*A*, Measuring the total length of the arm, anterior; *B*, measuring total length of the right arm, posterior; *C*, measuring the upper segment of the right arm, posterior; *D*, measuring vertical girth of trunk, encircling the figure at the crotch, across the middle of the right shoulder line, and over the largest part of the right breast; *E* and *F*, measuring from cervicale, around right side of neck to midpoint of the waistline at the front. Views from subject's right and left sides, respectively.

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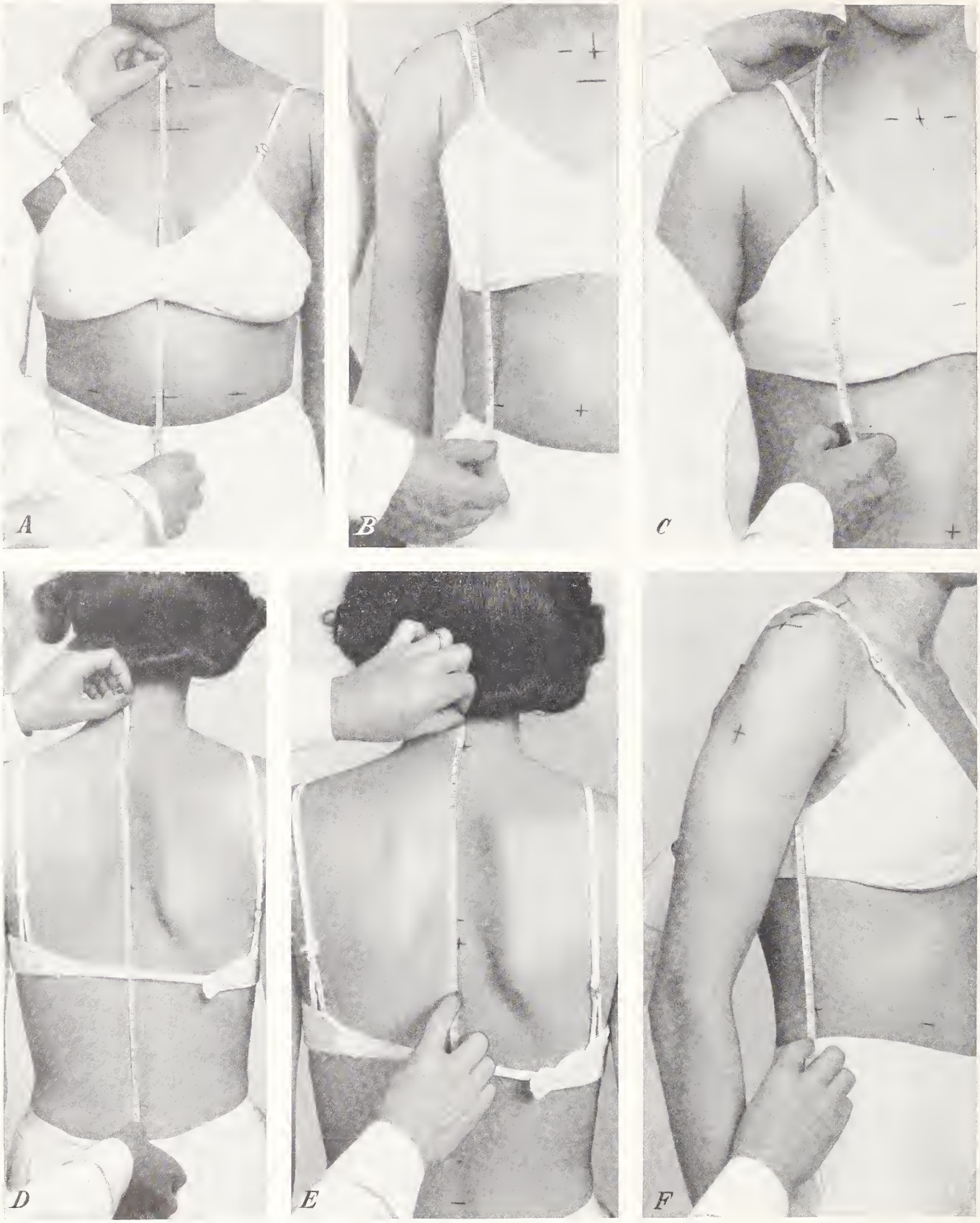

Plate 6.—*A*, Measuring the anterior length of waist; *B*, the position of the tape when measuring from shoulder to waist over the greatest prominence of the bust; *C*, measuring length from right side of neck to bust; *D*, measuring the posterior length of the waist; *E*, measuring the depth of seye; *F*, measuring the trunk line.

Position of subject. The subject stood normally with head erect.

Position of measurer.—The measurer stood in front of the subject, slightly to her right.

Procedure.—The zero point of the tape was placed at the average waist level on the right side of the subject. The tape was extended over the greatest prominence of the bust to the shoulder line, where the reading was made. The tape was held perpendicular to the floor. While the tape was held in this position, a dot was placed at the point where the tape passed over the top of the curved outline of the bust. A corresponding mark was placed on the left side, providing landmarks for measurement No. 49, highest bust-level width.

20. Neck to bust, right (pl. 6, C):

Landmarks.—Bust level and intersection of shoulder line and neck base.

Instrument.—Tape.

Position of subject.—Identical to that assumed for measurement No. 19.

Position of measurer.—The measurer stood in front of the subject, slightly to her right side.

Procedure.—The zero point of the tape was placed at the intersection of the right shoulder line with the neck base. The reading was made at the greatest prominence of the bust.

21. Posterior waist length (pl. 6, D):

Landmarks.—Cervicale and the average waist level at the center back.

Instrument.—Tape.

Position of subject.—See measurement No. 18.

Position of measurer.—The measurer stood back of the subject, slightly to her left.

Procedure.—The zero point of the tape was placed at the cervicale. The subject was cautioned against dropping the head forward. The tape was allowed to follow the contour of the back without constriction. The reading was made at the average waist level, center back.

22. Scye depth (pl. 6, E):

Landmarks.—Cervicale and level of underarm midpoint marked in the median sagittal plane.

Instrument.—Tape.

Position of subject.—The subject stood with head erect and eyes directed forward.

Position of measurer.—Identical to that assumed for measurement No. 34.

Procedure.—The zero point of the tape was placed at cervicale, the subject being cautioned not to lower the head. The reading was made at the point in the median sagittal plane which indicated the position of the upper border of the tape when it was placed for the measurement of girth of chest at armscye (see measurement No. 28).

23. Trunk line, right (pl. 6, F):

Landmarks.—Right underarm midpoint and average waist level at the right side.

Instrument.—Tape.

Position of subject.—The subject stood normally, with head erect.

Position of measurer.—The measurer sat at the right side of the subject.

Procedure.—The zero point of the tape was placed at the right underarm midpoint. After the subject lowered the arm, allowing it to hang relaxed at her side, the tape was passed directly to the average waist level marked on the right side and the reading was taken.

24. Arm length, shoulder to scye (pl. 7, A):

Landmarks.—Shoulder point and intersection of upper arm bisection with the armscye level placed after taking measurement No. 43.

Instrument.—Tape.

Position of subject.—The subject stood erect, arms hanging at her sides.

Position of measurer.—The measurer stood at the right of the subject.

Procedure.—The zero point of the tape was placed at the shoulder point and the tape extended to the armscye level, the reading being taken at the intersection of the armscye level and the bisecting line of the upper arm.

25. Waist to hips, right (pl. 7, B):

Landmarks.—Average waist level and average hip level, both on the right side.

Instrument.—Tape.

Position of subject.—The subject stood erect with arms folded across her chest.

Position of measurer.—The measurer sat to the right of the subject.

Procedure.—The zero point of the tape was placed at the average waist level on the right side. The reading was made at the average hip level, the tape passing over the measuring garment.

26. Total crotch length (pl. 7, C):

Landmarks.—Average waist levels, center front and back.

Instrument.—Tape.

Position of subject.—After pulling up the measuring suit by the waist band to insure a snug adjustment at the crotch, the subject placed her left foot on a stool or other steady object which elevated the left foot to the midlevel of the patella of the right leg. Her weight was evenly distributed on her feet, the long axis of the right leg being held approximately perpendicular and the principal transverse axis of the pelvis approximately horizontal to the floor. The right foot was directed straight forward and the left

hand rested on the left thigh. The head and trunk were erect.

Position of measurer.—The measurer sat at the left side of the subject while placing the zero point, and was at the center back with her eyes at the average waist level when the reading was made.

Procedure.—After the measurer placed the zero point of the tape at the average waist level in center front, the subject held it in position flat against the abdomen with two fingers spread so that the position of the zero point could be checked without moving her fingers. The measurer passed the tape centrally over the genitourinary space and the perineum to the average waist level at center back. The reading was made with the tension of the tape approximately that provided by the weight of the tape case.

27. Anterior crotch length (pl. 7, D):

Landmarks.—Average waist level, anterior, and crotch center.

Instrument.—Tape.

Position of subject.—Same as measurement No. 26.

Position of measurer.—The measurer squatted at the subject's left side with eyes at crotch level.

Procedure.—The zero point of the tape was placed at the average waist level in the center front and held by the subject while measurement No. 26 was taken. The measurer then dropped the tape from the average waist level in the center back to the crotch level. There the tape was supported on the measurer's left index finger while the tape case hung free, thus providing the tension on the tape which was desired for this measurement. The tape was lowered from the perineum by the width of the tip of the measurer's index finger so that the measurer could grasp the tape between the index finger and thumb at the medial landmark of the thigh. This landmark was the reading point for the measurement. The reading was taken while the tape was held at a distance equal to the width of the index finger below the perineum.

28. Chest girth at armscye (pl. 8, A):

Landmarks.—The underarm midpoints on the right and left sides.

Instrument.—Tape.

Position of subject.—The subject stood erect. Care was taken that the shoulders were relaxed.

Position of measurer.—The measurer stood back of the subject.

Procedure.—The tape was placed around the trunk without constriction with the zero point at the center back. The upper border of the tape rested under the arms at the level of the armscye of the trunk and passed through the underarm midpoints of the right and left armscye. When the tape was satisfactorily placed, the measurer passed around to the side of the subject to check the relative positions of the anterior and posterior arcs of the girth and to be sure they lay in the same horizontal plane. The reading was made at the midpoint of respiration. Before removing the tape, the level of its upper border was marked posteriorly by a dot in the median sagittal plane, providing a reading point for measurement No. 22.

29. Bust girth (pl. 8, B):

Landmarks.—Level of maximum bust girth, posterior and anterior.

Instrument.—Tape.

Position of subject.—The subject's position was her normal, erect posture with feet together.

Position of measurer.—The measurer stood at the center front of the subject.

Procedure.—The tape was passed around the chest so that the upper border was at the level indicated for the measurement of the maximum girth, and the zero point was at the center front. The anterior and posterior arcs of the girth lay in the same horizontal plane. The girth was measured without constriction of the musculature and mammary glands and the reading was made at the midpoint of respiration.

30. Waist girth (pl. 8, C):

Landmarks.—Average waist level, anterior, posterior, and lateral.

Instrument.—Tape.

Position of subject.—Identical with that assumed for measurement No. 29.

Position of measurer.—The measurer sat in front of the subject.

Procedure.—The tape was passed around the body at waist level with the upper border of the tape resting on the landmarks and the zero point at the center front. The measurement was taken without constriction and the reading made when the breathing was normal at the midpoint of respiration.

31. Abdominal-extension girth (pl. 8, D):

Landmarks.—Level of abdominal extension, posterior, anterior and lateral.

Instrument.—Tape.

Position of subject.—The subject stood erect with her hands folded across her chest.

Position of measurer.—The measurer stood to the right of the subject.

Procedure.—The tape was passed around the body so that the upper border of the tape was at the level previously marked as the greatest extension of the abdomen. The zero point was placed on the right side of the subject and the measurement taken without constriction.

32. Hip girth (pl. 9, A):

Landmarks.—Average hip level, right and left sides.

Instrument.—Tape.

Position of subject.—The subject's position was

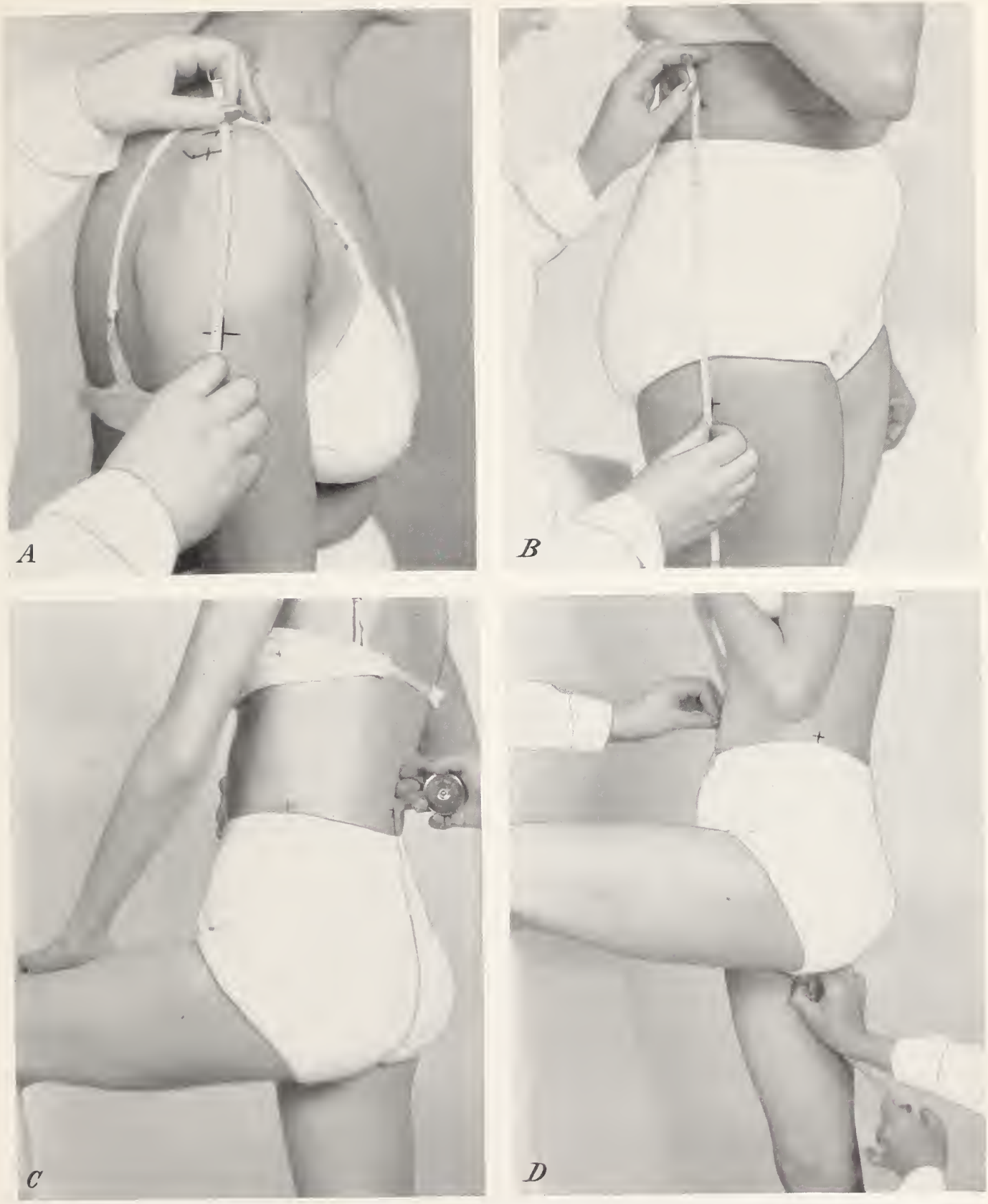

Plate 7.—*A*, Measuring the sleeve-cap length of the right arm from shoulder to scye; *B*, measuring distance from waist to hip; *C*, measuring total crotch length; *D*, measuring anterior crotch length.

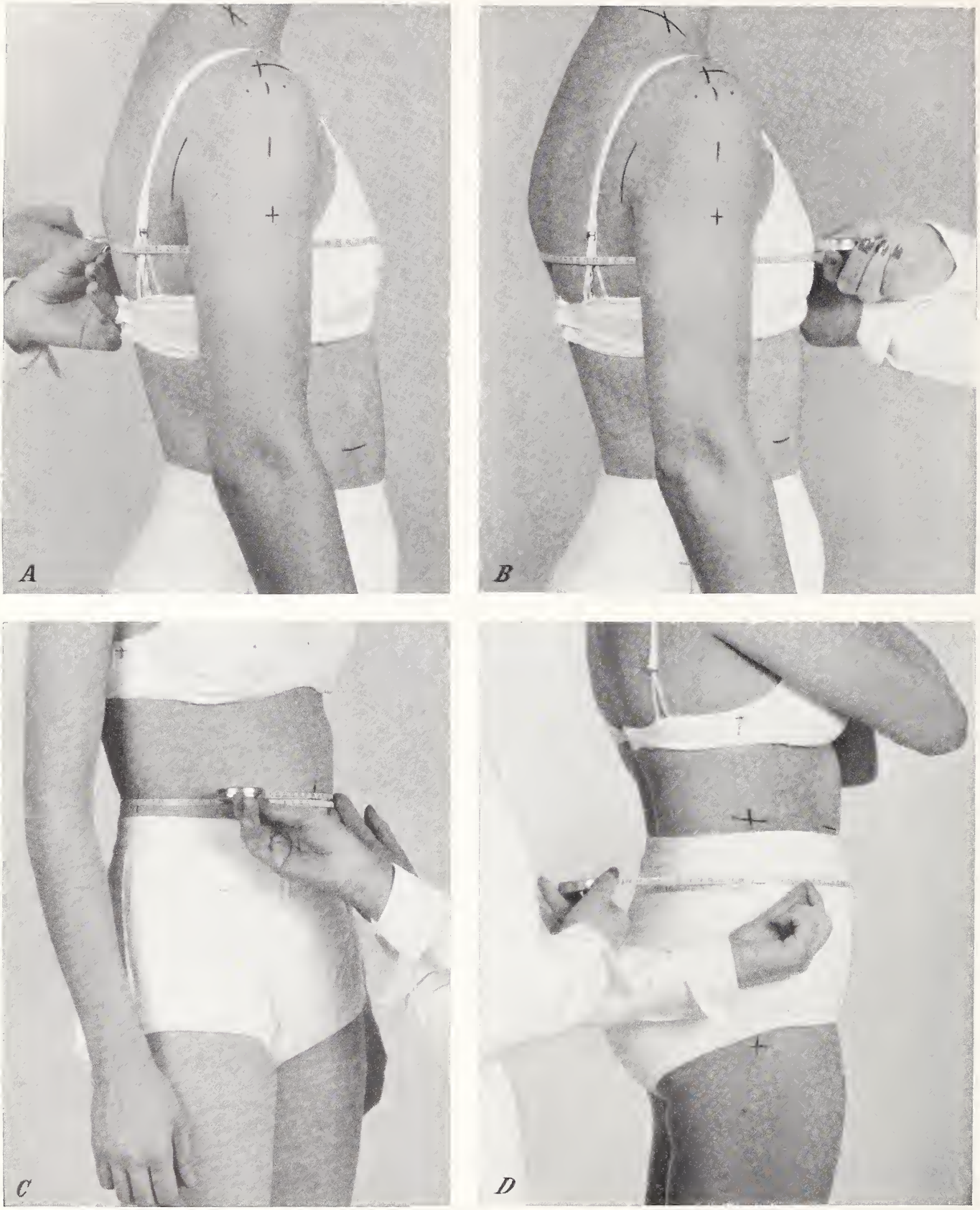

Plate 8.—*A*, Measuring girth of chest at armseye; *B*. measuring maximum girth of bust; *C*, measuring the girth of the waist; *D*, measuring the girth of the abdominal extension.

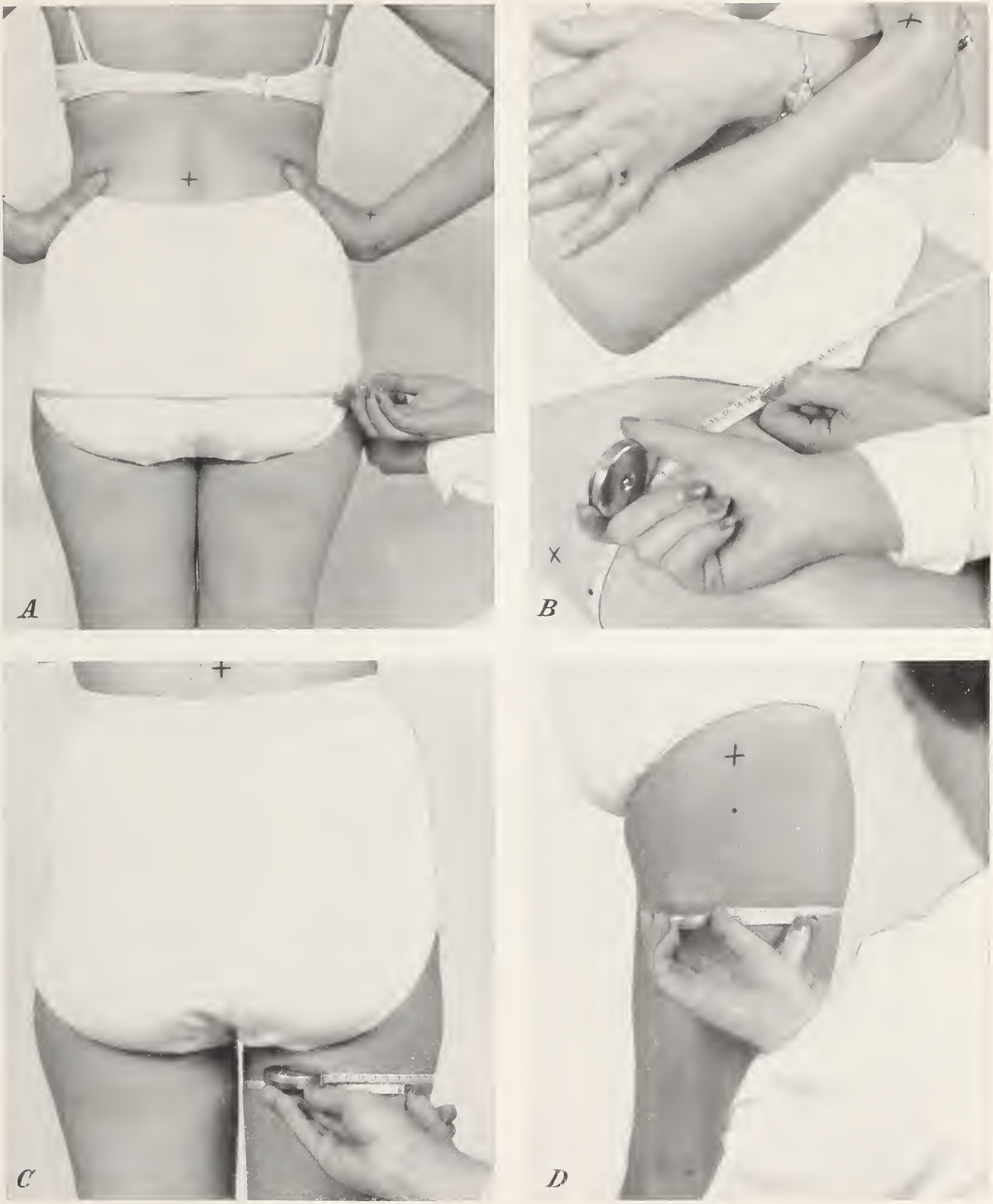

Plate 9.—*A*, Measuring the girth of the hips; *B*, measuring the girth of the sitting spread; *C*, measuring the maximum girth of the thigh; *D*, measuring the girth of the thigh midway between the average hip level and the tibiale.

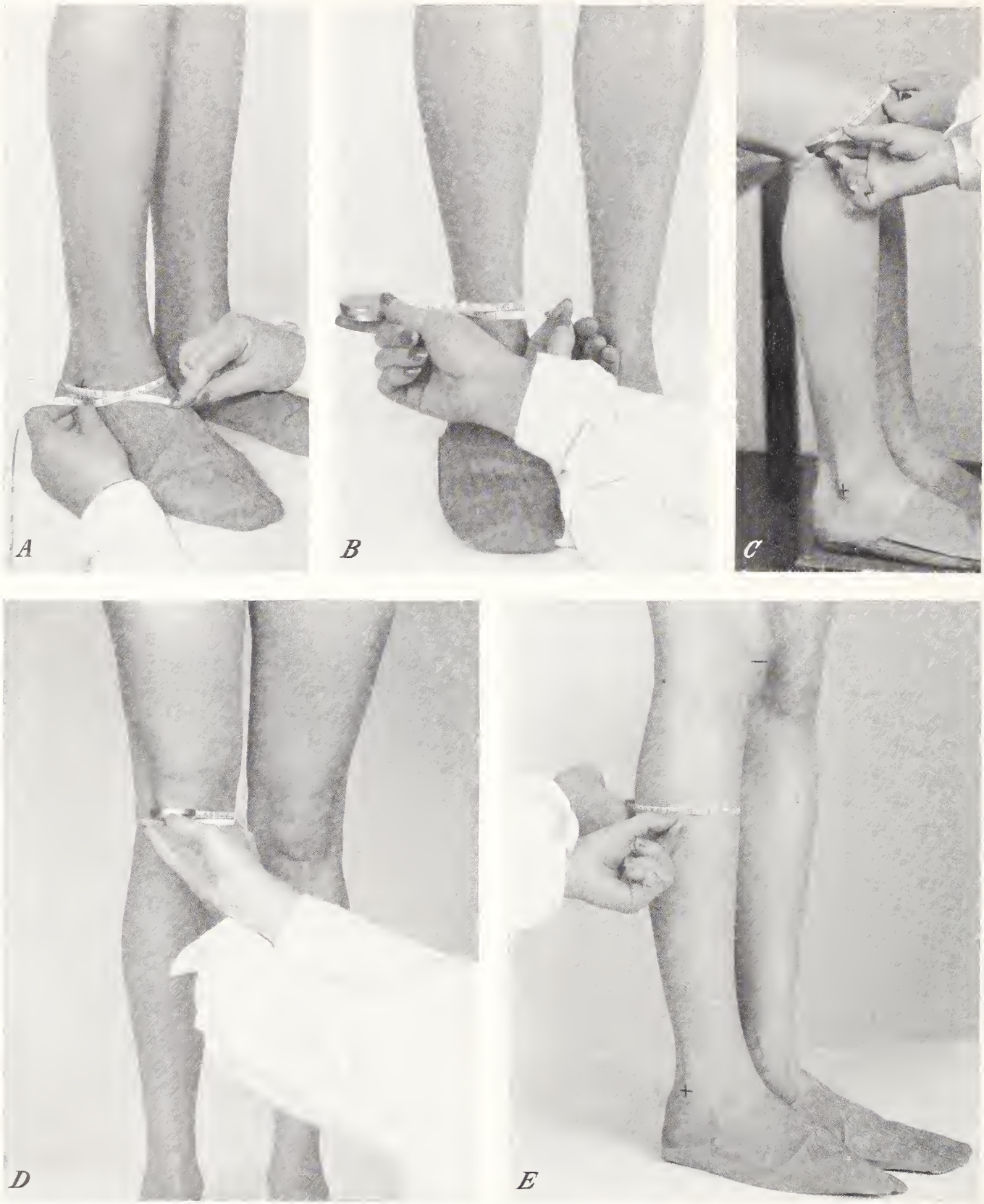

Plate 10.—*A*, Measuring the girth of the ankle; *B*, measuring the minimum girth of the leg; *C*, measuring the girth of the knee when bent; *D*, measuring the girth of the knee at tibiale; *E*, measuring the maximum girth of the calf.

her normal, erect posture with feet together and hands on her hips.

Position of measurer.—The measurer sat at the right side of the subject and made the reading with her eyes at the subject's hip level.

Procedure.—The tape was placed around the body so that the upper border rested on the landmarks and the zero point was at the hip level on the right side. The plane of the girth was horizontal and the measurement was taken without constriction.

33. Sitting-spread girth (pl. 9, B):

Landmarks.—Average level on the right and left sides of the greatest extension of the thighs when the subject was sitting.

Instrument.—Tape.

Position of subject.—With the tape under the thighs, the subject sat erect on a table which was too high for her feet to reach the floor. The bend of her knees touched the edge of the table. Her hands were folded across her chest and her thighs relaxed.

Position of measurer.—The measurer stood in front of the subject.

Procedure.—The recorder or aide assisted the measurer in placing the upper border of the tape on the landmarks so that the plane of the girth was vertical and the tape was snug but not tight. On very heavy women, the tape crossed part of the lower abdomen.

34. Maximum thigh girth (pl. 9, C):

Landmark.—None.

Instrument.—Tape.

Position of subject.—The subject's position was her normal erect posture with her hands away from her hips. The feet were parted a few centimeters to permit the tape to pass freely between the medial surfaces of the thighs.

Position of measurer.—The measurer squatted back of the subject with her eyes on the level of the gluteal fold.

Procedure.—The tape was placed around the largest part of the thigh girth without constriction and with the plane of the girth parallel with the floor. The zero point of the tape was directly in front of the measurer.

35. Midway thigh girth (pl. 9, D):

Landmark.—Midway between average hip level and tibiale.

Instrument.—Tape.

Position of subject.—Same as for measurement No. 34.

Position of measurer.—The measurer squatted at the subject's right side.

Procedure.—The distance between the average hip level and tibiale was measured and a landmark indicated half way between these points. The tape was then placed around the thigh at this midpoint level without constriction. The plane of the girth was kept parallel with the floor.

36. Bent knee girth (pl. 10, C):

Landmark.—Midpoint of patella.

Instrument.—Tape.

Position of subject.—The subject sat on a table with the feet placed in a chair high enough to form a right angle at the knee.

Position of measurer.—The measurer sat in front of the subject.

Procedure.—The tape was placed around the knee without constriction, the zero point of the tape at the center front and the upper border at the level of the midpoint of the patella.

37. Knee girth at tibiale (pl. 10, D):

Landmark.—Tibiale.

Instrument.—Tape.

Position of subject.—Same as for measurement No. 34.

Position of measurer.—The measurer squatted in front of the subject with her eyes at the level of tibiale.

Procedure.—The tape was placed around the knee without constriction, with the upper border of the tape at the level of tibiale and the zero point at center front. The plane of the girth was horizontal.

38. Maximum calf girth (pl. 10, E):

Landmarks.—None.

Instrument.—Tape.

Position of subject.—Same as for measurement No. 34.

Position of measurer.—The measurer squatted at the right side of the subject with her eyes at the midlevel of the tibia.

Procedure.—The tape was placed around the calf where the measurer, by inspection of the posterior profile, judged the girth to be maximum. The plane of the girth was kept parallel with the floor.

39. Minimum leg girth (pl. 10, B):

Landmark.—None.

Instrument.—Tape.

Position of subject.—Same as for measurement No. 36.

Position of measurer.—Same as for measurement No. 36.

Procedure.—The tape was placed without constriction above the lateral and the medial malleoli at the minimum girth.

40. Ankle girth (pl. 10, A):

Landmark.—Medial point of malleolus medialis.

Instrument.—Tape.

Position of subject.—Same as for measurement No. 36.

Position of measurer.—The measurer squatted in front of the subject.

Procedure.—The tape was placed around the ankle so that the upper border passed through the landmark with the zero point in the center front. It was held with sufficient tension to maintain it in position at the landmark and over the irregular contours of the ankle.

41. Neck-base girth (pl. 11, A):

Landmarks.—Cervicale and the lateral and the anterior landmarks on the base of the neck.

Instruments.—Fine-gage, flexible-link chain and anthropometer.

Position of subject.—The subject sat erect with her arms dropped at her sides.

Position of measurer.—The measurer stood back of the subject, slightly to her right side.

Procedure.—When the neck chain was adjusted at the neck base, and the landmarks of the neck located (see Landmarks of the Neck, p. 5), the points at which the chain crossed the cervicale were pinched between the thumb and index finger of each hand, the chain removed from the neck and this distance measured by placing the chain along the anthropometer.

42. Armscye girth, right (pl. 11, B and C):

Landmarks.—Underarm midpoint, armscye anterior and posterior, and armscye-shoulder line intersection.

Instrument.—Tape.

Position of subject.—The subject's position was her normal posture with feet together and arms relaxed at her sides.

Position of measurer.—The measurer stood back of the subject, slightly to the right side.

Procedure.—The subject's right arm was raised sufficiently to permit the measurer to place the tape under it with the thin edge of the tape passed through the underarm midpoint and the zero point falling just below the armscye at the back. The case end of the tape was brought up over the shoulder and the case allowed to drop down over the back, thus providing the tension for this measurement. The anterior folds at the axillary fossa of the arm were eased under the tape. The lateral margin of the tape was fitted to the armscye, anterior and posterior, as well as to the armscye-shoulder line intersection. The loop of the tape was raised without unduly binding the posterior folds at the axillary fossa. The zero point of the tape was placed laterally with respect to the case end of the tape and the measurement was read.

43. Upper-arm girth, right (pl. 11, D):

Landmark.—Armscye level on the trunk and upper arm bisection.

Instrument.—Tape.

Position of subject.—Identical with position assumed for measurement No. 42.

Position of measurer.—The measurer stood at the right side of the subject with her eyes at the level of measurement.

Procedure.—The tape was passed around the upper arm with the zero point at the upper arm bisection and the upper border in line with the armscye level of the trunk. The plane of the girth was horizontal when the arm hung relaxed so that the principal long axis was approximately perpendicular to the floor. Before the tape was removed, the level of its upper border was marked at the zero point by a small line. Thus a reading point was provided for measurement No. 24.

44. Elbow girth, right (pl. 11, E):

Landmark.—Olecranon.

Instrument.—Tape.

Position of subject.—The subject stood in a normal, erect position, her right arm flexed approximately 90° at the elbow and the hand and fingers extended anteriorly. The upper arm was directed downward perpendicularly to the floor.

Position of measurer.—The measurer stood at the right side of the subject with her eyes at the level of the measurement.

Procedure.—The tape, with zero point in front of measurer, was placed around the elbow so that it passed without constriction over the landmark on the olecranon and bisected the angle of the bent elbow.

45. Forearm girth (pl. 11, F):

Landmark.—None.

Instrument.—Tape.

Position of subject.—Same as for measurement No. 44.

Position of measurer.—Same as for measurement No. 44.

Procedure.—The tape, with the zero point directly in front of the measurer, was placed without constriction around the arm at the angle formed when the forearm was flexed at a 90° angle to the upper arm. The plane of the girth was perpendicular to the floor. The tape case provided the tension.

46. Wrist girth (pl. 12, A):

Landmarks.—Distal limit of the ulna and the radius midanterior wrist point.

Instrument.—Tape.

Position of subject.—The subject stood with the forearm extended anteriorly and the palm directed upward.

Position of measurer.—The measurer stood in front of the subject.

Procedure.—The zero point of the tape was placed at the midanterior wrist point and the tape passed

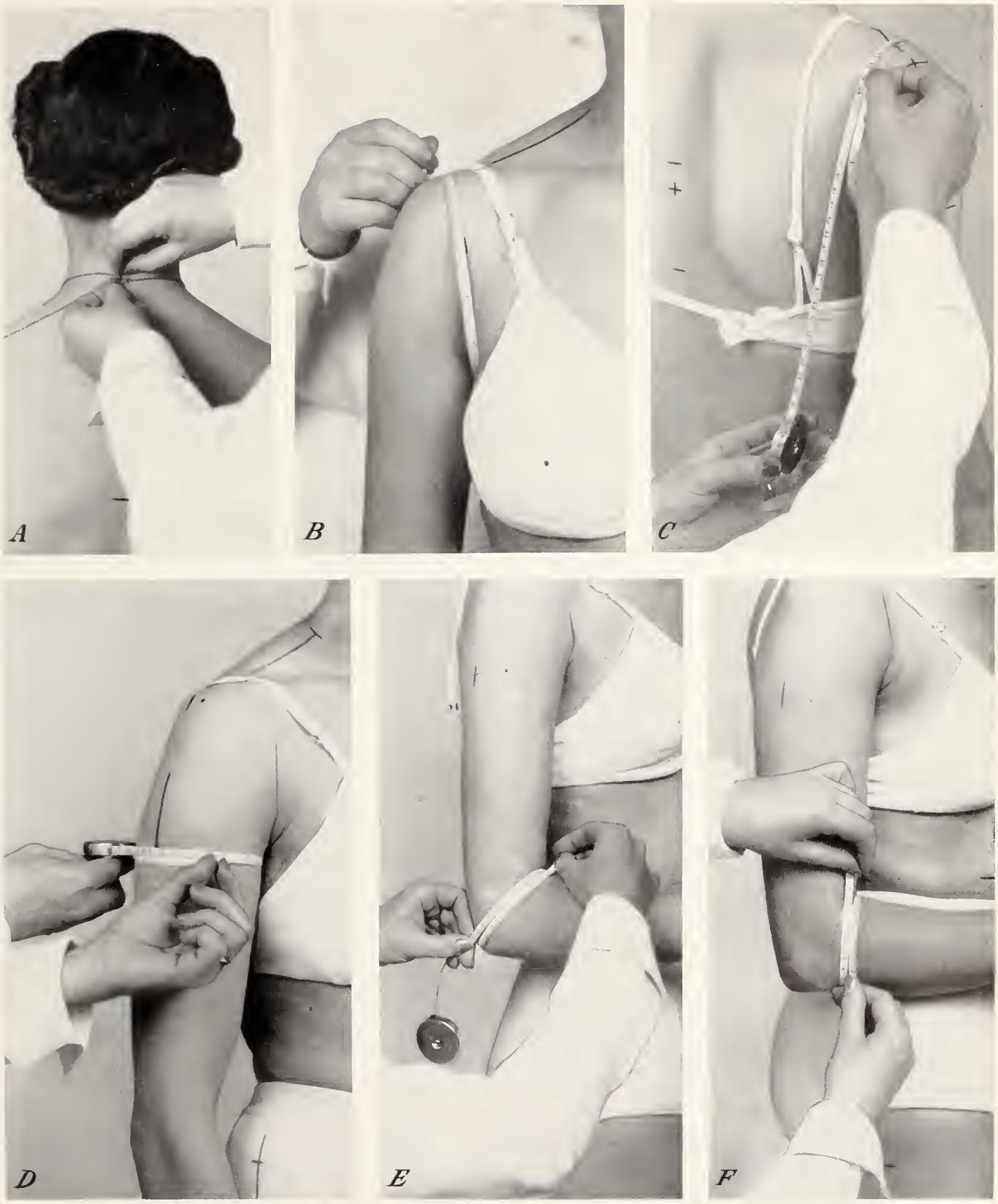

Plate 11.—*A*, Measuring the base of the neck; *B*, measuring the armseye, front view; *C*, measuring the armseye, back view; *D*, measuring girth of upper arm; *E*, measuring the girth of the elbow; *F*, measuring the girth of the forearm.

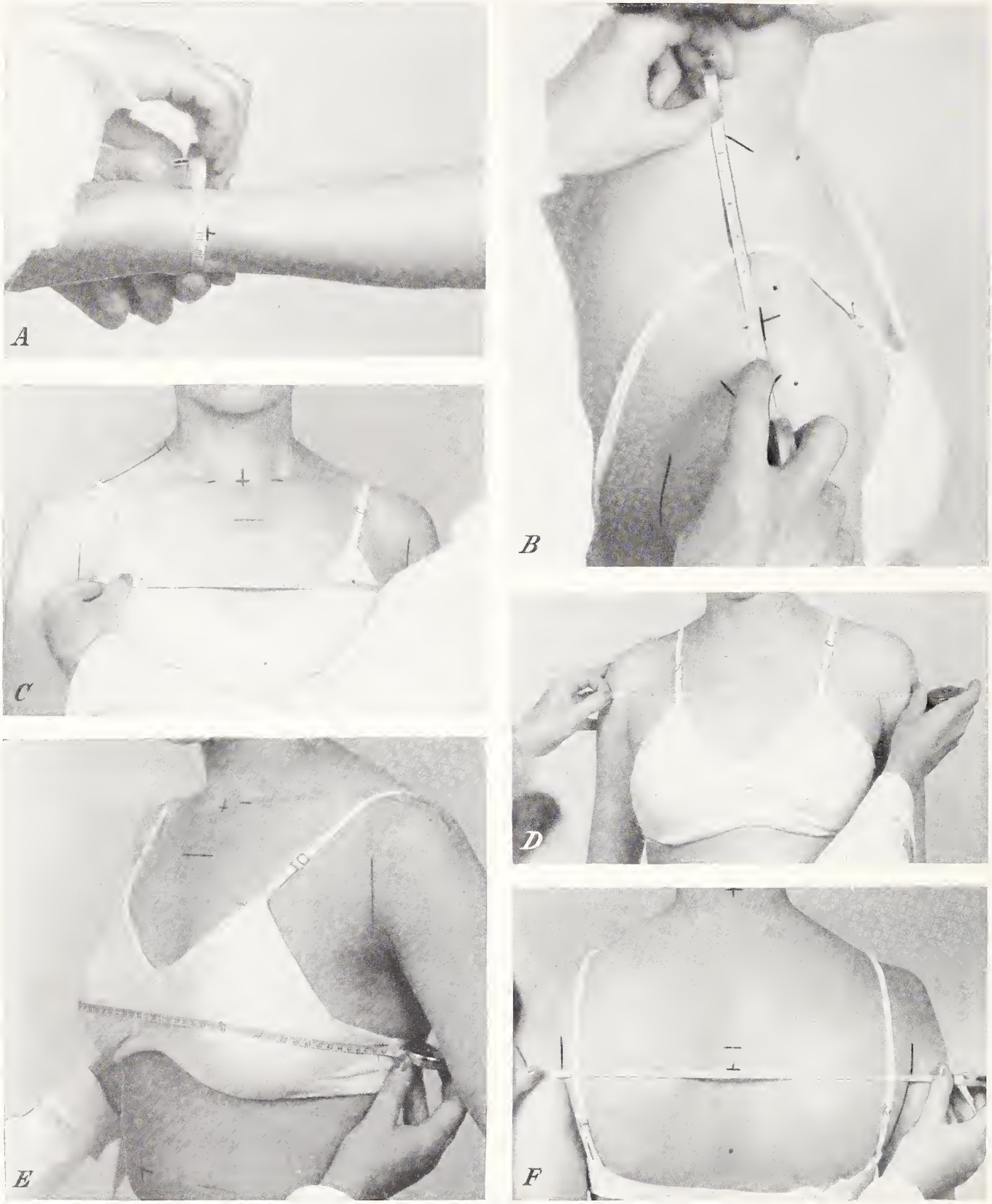

Plate 12.—*A*, Measuring the girth of the wrist; *B*, measuring the shoulder length; *C*, measuring width of highest bust level; *D*, measuring the anterior width of the chest; *E*, measuring the anterior are of the bust; *F*, measuring the posterior width of the chest.

without constriction over the landmarks at the extremity of the ulna and the radius.

47. Shoulder length (pl. 12, B):

Landmarks.—The intersections of the shoulder line with the neck base and the armscye.

Instrument.—Tape.

Position of subject.—The subject's position was her normal, erect posture with feet together and her arms relaxed at her sides.

Position of measurer.—The measurer stood back of the subject's right shoulder.

Procedure.—The zero point of the tape was located at the intersection of the neck base with the shoulder line, the anterior border placed along the shoulder line, and the reading taken at the intersection of the armscye with the shoulder line. The subject was cautioned against lowering the shoulder or drawing the head away from the tape.

48. Anterior chest width (pl. 12, D):

Landmarks.—Armscyes, anterior, right and left, and the level for the width of chest, anterior.

Instrument.—Tape.

Position of subject.—Same as for measurement No. 21.

Position of measurer.—The measurer stood in front of the subject with her eyes at the level of measurement.

Procedure.—The subject was informed that this measurement as well as measurements Nos. 18, 21, and 50 were to be made while she stood in the same position and that it was important that she maintain the same posture as when her stature was measured. The upper border of the tape was placed horizontally, without constriction, at the level of the anterior landmark with the zero point at the right armscye. The reading was taken on the armscye of the left arm.

49. Highest bust-level width (pl. 12, C):

Landmarks.—Those placed when measurement No. 19 was taken.

Instrument.—Tape.

Position of subject.—Same as for measurement No. 48.

Position of measurer.—The measurer stood in front of the subject.

Procedure.—The zero end of the tape was placed on the landmark above the right bust, the tape passed across the chest parallel to the floor and read at the landmark above the left bust.

50. Posterior chest width (pl. 12, F):

Landmarks.—Armscyes, posterior, right and left, and the level for the width of chest, posterior.

Instrument.—Tape.

Position of subject.—Same as for measurement No. 18.

Position of measurer.—The measurer was back of the subject, with her eyes at the level of measurement.

Procedure.—The upper border of the tape was passed horizontally, without constriction, at the level of the spinous process of the seventh thoracic vertebra with the zero point placed at the left armscye. The reading was taken at the right armscye.

51. Anterior bust arc (pl. 12, E):

Landmarks.—Average bust level, right and left sides.

Instrument.—Tape.

Position of subject.—The subject's position was her normal, erect posture.

Position of measurer.—The measurer sat in front of subject with her eyes at the level of measurement.

Procedure.—The zero point of the tape was placed at the average bust level on the subject's right side, the tape passed across the largest part of the bust, and the reading taken at the corresponding level on the left side. Care was exercised not to constrict the musculature and the mammary glands. The reading was taken at the midpoint of respiration.

52. Anterior waist arc (pl. 13, A):

Landmarks.—Average waist level, center front, and right and left sides.

Instrument.—Tape.

Position of subject.—Same as for measurement No. 30.

Position of measurer.—Same as for measurement No. 30.

Procedure.—The zero point of the tape was placed at the average waist level on the subject's right side and the tape passed without constriction across the waist at the average waist level in the center front. The reading was taken at the corresponding level on the left side.

53. Abdominal-extension arc (pl. 13, B):

Landmarks.—Levels of the abdominal extension at right and left sides and at center front.

Instrument.—Tape.

Position of subject.—Same as for measurement No. 31.

Position of measurer.—The measurer sat in front of the subject.

Procedure.—The zero point of the tape was placed at the landmark on the right side which indicated the level of the greatest abdominal extension. The tape was then passed without constriction across to the corresponding level on the left side, where the reading was taken. The upper border rested on the front landmark.

54. Posterior hip arc (pl. 13, C):

Landmarks.—Average hip level at the right and left sides.

Instrument.—Tape.

Position of subject.—The subject stood erect

with feet together, her weight evenly distributed on her feet and her hands folded across her chest.

Position of measurer.—The measurer squatted back of the subject with her eyes at hip level.

Procedure.—The zero point of the tape was placed at the average hip level on the left side, the tape passed without constriction across the hips parallel to the floor. The reading was made on the right thigh at hip level.

55. Bust girth over foundation garment (pl. 14, A):

Landmarks.—Level of maximum bust girth, posterior, anterior and lateral, over foundation garment.

Instrument.—Tape.

Position of subject.—Same as for measurement No. 29.

Position of measurer.—Same as for measurement No. 29.

Procedure.—Same as for measurement No. 29.

56. Waist girth over foundation garment (pt. 14, B):

Landmarks.—Average waist level, anterior, posterior, and lateral, over foundation garment.

Instrument.—Tape.

Position of subject.—Same as for measurement No. 30.

Position of measurer.—Same as for measurement No. 30.

Procedure.—Same as for measurement No. 30.

57. Abdominal-extension girth over foundation garment (pl. 14, C):

Landmarks.—Level of greatest abdominal extension, posterior, anterior and lateral, over foundation garment.

Instrument.—Tape.

Position of subject.—Same as for measurement No. 31.

Position of measurer.—Same as for measurement No. 31.

Procedure.—Same as for measurement No. 31.

58. Hip girth over foundation garment (pl. 14, D):

Landmarks.—Average hip level, right and left sides, over foundation garment.

Instrument.—Tape.

Position of subject.—Same as for measurement No. 32.

Position of measurer.—Same as for measurement No. 32.

Procedure.—Same as for measurement No. 32.

59. Shoulder slope (pl. 13, D):

Landmarks.—Intersections of shoulder line with neck base and armscye.

Instrument.—Protractor.

Position of subject.—The subject sat erect, well back on a chair, with her arms hanging at her sides.

Position of measurer.—The measurer stood at the right side of the subject.

Procedure.—The wooden blade of the protractor was rested on the intersections of the shoulder line with the neck base and with the right armscye. The subject was asked to carry the weight of the instrument on her shoulder without altering the position of the shoulder. In placing the protractor, the intersection of the shoulder line and the armscye was used as the pivotal point and the opposite end of the wooden blade was lowered to the intersection of the shoulder line and neck base where it was rested lightly without depressing the skin surface. The instrument was balanced on the landmarks, steadied by the right hand, while the thumb and index finger of the left hand adjusted the spirit level to the horizontal position. When the protractor could not be brought to rest on the intersections of the shoulder line with the neck base and armscye, due to interference with higher points, the blade was poised on the highest point but its direction kept in that of the shoulder line.

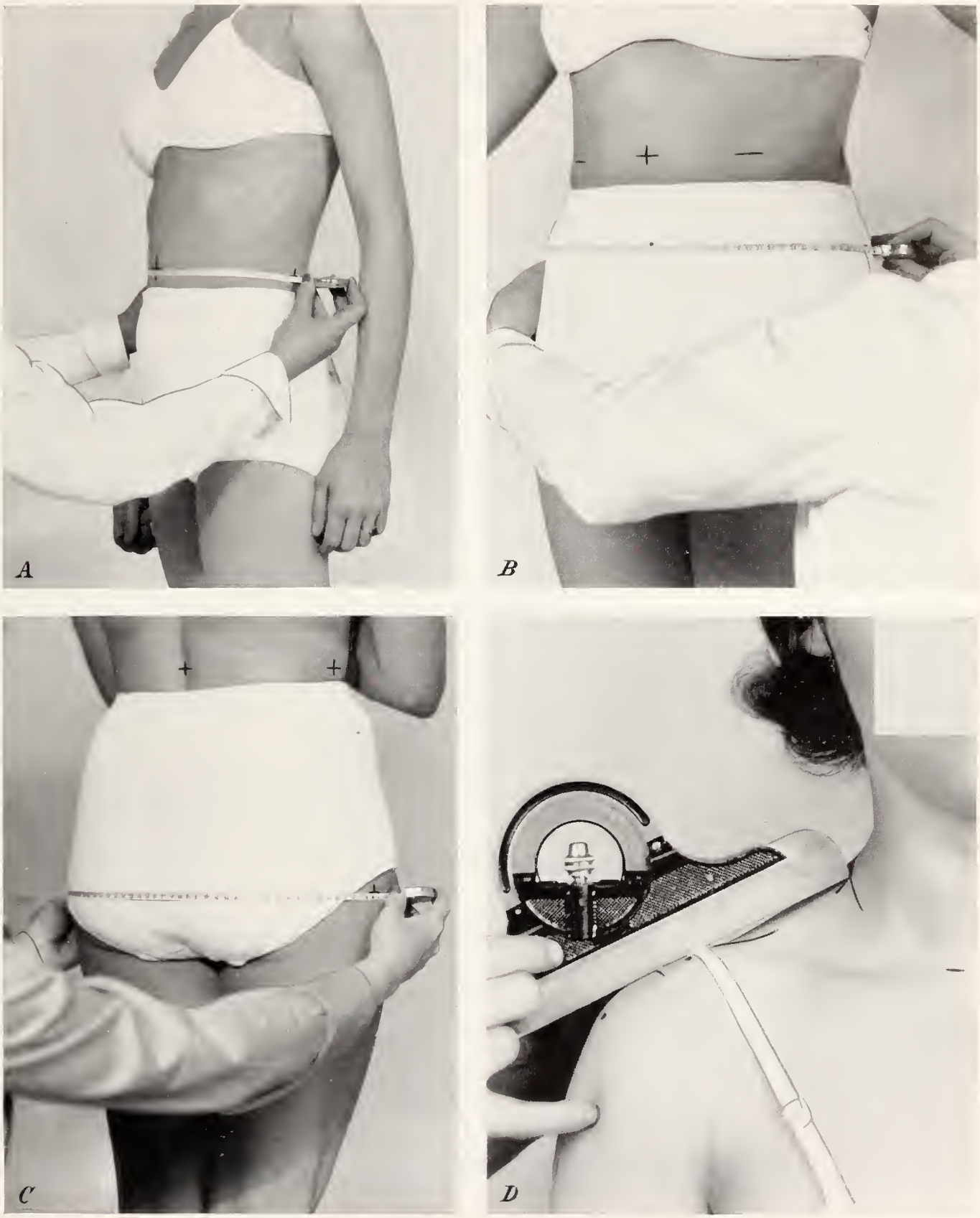

Plate 13.—*A*, Measuring the anterior arc of the waist; *B*, measuring the arc of the greatest extension of the abdomen; *C*, measuring the posterior arc of the hips; *D*, measuring the shoulder slope.

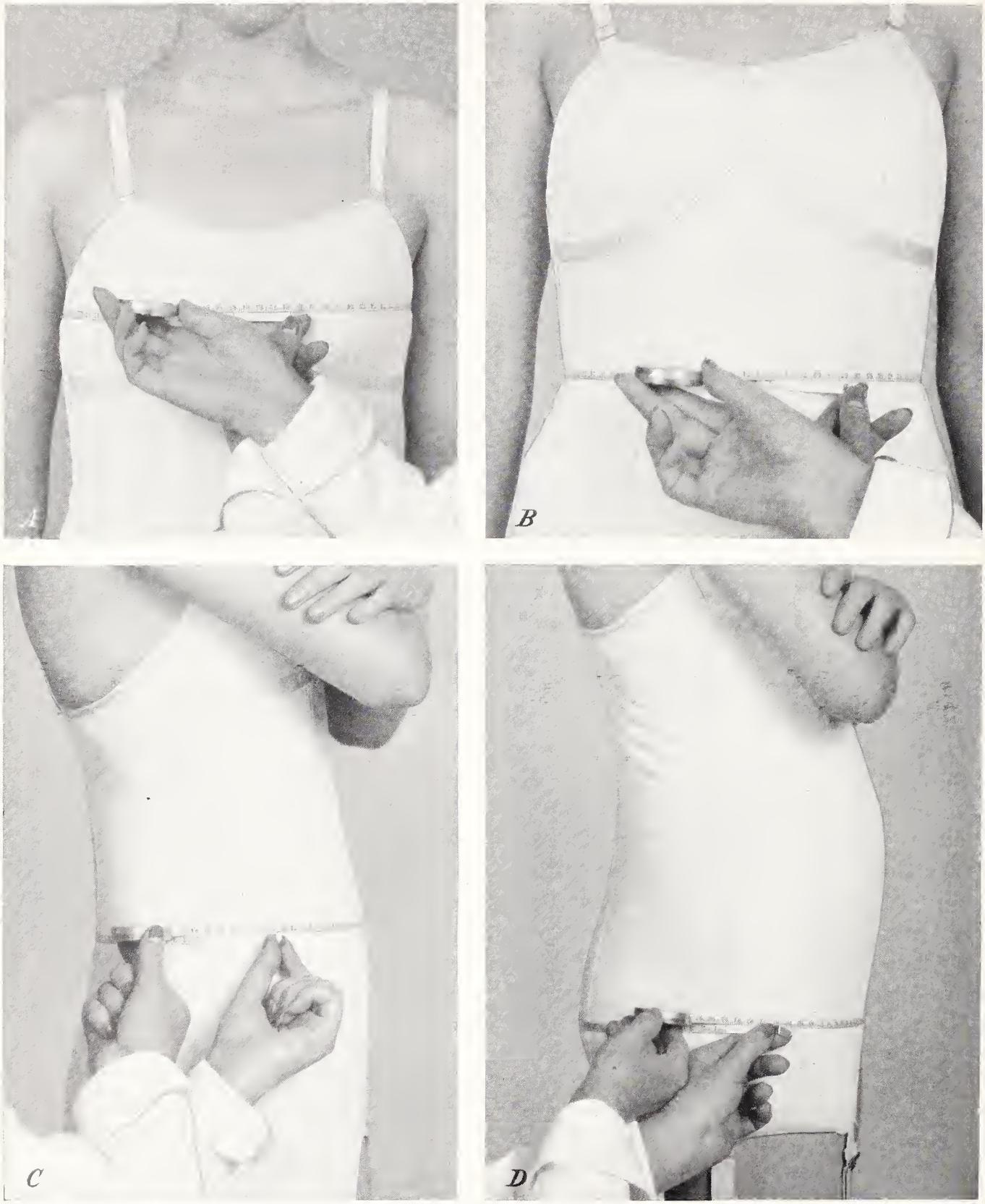

Plate 14.—*A*, Measuring the girth of the bust over a foundation garment; *B*, measuring the girth of the waist over a foundation garment; *C*, measuring the girth of the greatest abdominal extension over a foundation garment; *D*, measuring the girth of the hips over a foundation garment.

The Schedule

The original measuring record was made on a printed schedule, the front and reverse sides of which are shown on pages 23 and 24. Each woman who presented herself for measurement was asked to fill in the information requested on the front of the form. The data called for included the name of the woman, the club or other organization through which she had volunteered to be measured, her address, the classification of her place of residence as rural or urban (residence in a town of less than 2,500 people was considered rural), the date the measurements were taken, the place and date of birth, number of children borne, occupation at present and during most of her adult life, and family income class, i. e., below $1,000, $1,000–$1,999, $2,000–$2,999, and $3,000 and over. When it was found necessary, for the sake of good feeling within a group, to measure a few women of other than the Caucasian race, this fact was entered under remarks and the schedule later discarded.

Editing the Schedules

All schedules collected in the field were sent to Washington, where they were edited, coded, and recorded on punch cards for machine tabulation.

In the editing process, schedules were first inspected to see that (1) the woman measured was of the Caucasian race, (2) her date of birth had been entered on the schedule, (3) she had passed her eighteenth birthday, (4) no measurements except those taken over foundation garments were omitted, and (5) no notation indicating physical deformity was on the schedule. Of the 14,698 schedules received from the field, 366 were rejected for one or more of these five reasons. Detailed data on these rejections are shown in table 1, page 25.

Schedules passing this preliminary inspection were edited to eliminate gross errors, that is, combinations of measurements which are anthropometrically impossible. Gross errors apparently arose most frequently through carelessness; for example, a measurement entered as 39.4 instead of 59.4, or 63.2 instead of 36.2. Because so many body measurements were taken, a relatively close check on the size of each could be obtained from related measurements, and a very large percentage of these errors eliminated.

On the basis of known anthropometric relationships, 22 editing checks were planned for the vertical measurements. A tally on each proposed check was obtained from 200 of the first schedules received from the field, and limits for each check were then set up to include 96 to 98 percent of these women [3]. The first check, for example, was based on the fact that stature must be greater than cervicale height, and tabulation of the first 200 schedules showed that the difference between the two measurements is nearly always between 16 and 32 centimeters. Twenty-four checks were set up for horizontal measurements, and four additional checks for the measurements over foundation garments. On page 22 is a complete list of the editing checks used.

Each of the checks was applied to every schedule passing the preliminary inspection. This work was done in an editing pool organized for the purpose, and schedules failing to satisfy one or more checks were turned over to the supervisor, who decided whether any of the measurements were anthropometrically impossible. If so, the schedule was classed as containing a gross error and was excluded from the analysis.[4] If not, the schedule was classed as containing a questioned item, but was included in the analysis even if one or more measurements seemed unreasonable.

Usually the classification as a gross error or a questioned item was easy to make. Doubt, when it existed, was resolved in favor of the questioned item in order to minimize the distortion of the statistical results with preconceptions of what combinations of body measurements are impossible. The number of schedules containing gross errors is shown, by State, in table 1. The total number 1,626 may seem large, but it must be remembered that every schedule contained at least 55 measurements, each of which offered a separate chance for error. A tabulation of gross errors and of questioned items also was made according to the measurer, in order to serve as a check for accuracy on each worker.

[3] For some checks, editing of the first few hundred schedules showed that the established limits were too narrow, and the upper limit was increased or the lower limit decreased. For these checks, the limits shown in the list are somewhat broader than the ones used for the first few hundred schedules.

[4] Three exceptions to this rule were made. First, in order to balance the sample better by age group, all schedules of women 60 years old and over were included in the analysis. Seventy-eight schedules were corrected—nearly all of them in only 1 measurement—for this purpose. Second, 13 schedules were corrected by inserting or deleting a "1" in the hundreds position of a measurement. Third, schedules having gross errors only in the measurements taken over foundation garments were included. In the latter cases, the corresponding skin measurement was substituted.

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Relationship	*Limits (centimeters)*
Vertical measurements: [1]	
(2) Stature *minus* (13) Cervicale height	16 to 32
(13) Cervicale height *minus* (12) Bust height	18 to 37
(12) Bust height *minus* (11) Waist height	2 to 19
(11) Waist height *minus* (8) Abdominal-extension height	4 to 23
(8) Abdominal-extension height *minus* (7) Hip height	0 to 19
(7) Hip height *minus* (6) Sitting-spread height	0 to 16
(6) Sitting-spread height *minus* (14) Crotch height	—8 to 10
(14) Crotch height *minus* (16) Tibiale height	21 to 39
¼ of (16) Tibiale height *minus* (15) Ankle height	1 to 6
(5) Sitting height *plus* (7) Hip height *minus* (13) Cervicale height	—4 to 19
(18) Anterior crotch length *minus* ½ of (17) Total crotch length	—5 to 5
(26) Posterior waist length *minus* (24) Anterior waist length	0 to 10
(26) Posterior waist length *plus* (11) Waist height *minus* (13) Cervicale height	—3 to 7
(28) Scye depth *plus* (48) Trunk line *minus* (26) Posterior waist length	—6 to 6
(40) Neck to bust *plus* (12) Bust height *minus* (13) Cervicale height	—1 to 10
(41) Cervicale to waist anterior *plus* (11) Waist height *minus* (13) Cervicale height *minus* ⅓ of (3) Neck-base girth	—11 to 11
(42) Shoulder to waist *minus* (24) Anterior waist length *minus* ½ of (44) Shoulder length	—5 to 8
(49) Waist to hip *plus* (7) Hip height *minus* (11) Waist height	—3 to 8
(47) Total posterior arm length *minus* (34) Anterior arm length	11 to 22
(46) Upper posterior arm length *minus* ½ of (47) Total posterior arm length	2 to 7
(45) Arm length, shoulder to scye *minus* (44) Shoulder length	—3 to 6
(55) Vertical trunk girth *minus* (17) Total crotch length *minus* (24) Anterior waist length *minus* (26) Posterior waist length	0 to 16
Horizontal measurements: [1]	
(9) Abdominal-extension girth *equals* (19) Sitting-spread girth *equals* (50) Hip girth	within 21
(32) Waist girth *less than* (9) Abdominal-extension girth, (19) Sitting-spread girth, and (50) Hip girth.	
(27) Chest girth at armscye *minus* (31) Bust girth	—15 to 6
(27) Chest girth at armscye *minus* (32) Waist girth; (31) Bust girth *minus* (32) Waist girth	0 to 30

[1] Numbers in parentheses refer to measurement numbers on schedule.

Relationship	*Limits (centimeters)*
Horizontal measurements—Continued.	
(25) Posterior chest width *minus* (23) Anterior chest width	—6 to 9
(27) Chest girth at armscye *minus* (23) Anterior chest width *minus* (25) Posterior chest width	14 to 37
(23) Anterior chest width *minus* (43) Highest bust-level width	8 to 19
(10) Abdominal-extension arc *minus* ½ of (9) Abdominal-extension girth	—3 to 10
(29) Posterior hip arc *minus* ½ of (50) Hip girth	—6 to 6
(30) Anterior bust arc *minus* ½ of (31) Bust girth	0 to 14
(33) Anterior waist arc *minus* ½ of (32) Waist girth	0 to 15
(21) Ankle girth *minus* (22) Minimum leg girth	0 to 6
(20) Bent knee girth *minus* (54) Knee girth at tibiale	—3 to 7
(53) Maximum calf girth *minus* (22) Minimum leg girth	9 to 18
(52) Midway thigh girth *minus* (53) Maximum calf girth	9 to 25
(51) Maximum thigh girth *minus* (52) Midway thigh girth	2 to 12
¾ of (51) Maximum thigh girth *minus* (19) Sitting-spread girth	—13 to 13
(38) Forearm girth *minus* (39) Wrist girth	6 to 14
(37) Elbow girth *minus* (38) Forearm girth	—1 to 5
(36) Upper-arm girth *minus* (38) Forearm girth	—1 to 13
(36) Upper-arm girth *minus* ½ of (51) Maximum thigh girth	—7 to 7
½ of (27) Chest girth at armscye *minus* (35) Armscye girth	—3 to 9
(3) Neck-base girth *minus* (35) Armscye girth	—11 to 8
(55) Vertical trunk girth *plus* 2 times [(50) Hip girth *minus* 100] *minus* (1) Weight	0 to 32
(59) Bust girth over foundation garment *minus* (31) Bust girth	—8 to 8
(58) Waist girth over foundation garment *minus* (32) Waist girth	—8 to 8
(57) Abdominal-extension girth over foundation garment *minus* (9) Abdominal-extension girth	—8 to 8
(56) Hip girth over foundation garment *minus* (50) Hip girth	—8 to 8

Of the 12,706 schedules passing the editing process, only 10,042 were included in the major part of the analysis presented in this report. The remaining 2,664 were eliminated either because the schedules reached Washington too late to be included in the analysis or because their omission would assist in securing a distribution of women by age and marital status more closely approximating that of all white women in the United States.

Schedule 1

UNITED STATES DEPARTMENT OF AGRICULTURE
BUREAU OF HOME ECONOMICS

STUDY OF MEASUREMENTS FOR SIZING WOMEN'S GARMENTS AND PATTERNS

MEASUREMENT BLANK

Case No. [ ][ ][ ][ ]

(PRINT or WRITE plainly. Fill in lines only—NOT boxes)

(*a*) State measured in .....

(*b*) Name of measurer .....

(*c*) Name of woman measured ..... (*d*) Organization .....

(*e*) Address .....
(Post-office address) (County or town) (State)

(*f*) Place of dwelling; check one: Rural ..... urban .....
(Town over 2,500)

(*g*) Place of birth .....
(Country) (State or Province) (City)

(*h*) Date of measuring .....
(Day) (Month) (Year)

(*i*) Date of birth .....
(Day) (Month) (Year)

(*j*) Has woman measured ever been married? (answer Yes or No) .....

(*k*) Number of children borne .....

(*l*) Occupation: Present ..... (*m*) Most of adult life .....

(*n*) Approximate family income during 1939. Check one:

....
(Below $1,000) ($1,000 to $1,999) ($2,000 to $2,999) ($3,000 and over)

(*o*) REMARKS:

(Write plainly on solid lines—NOT in boxes)

1. Weight (lb.)				
2. Stature				
3. G. neck base				
4. Shoulder slope				
5. Sitting height				
6. Ht. sit. spread				
7. Height hips				
8. Ht. abdominal ext.				
9. G. abdominal ext.				
10. Arc abdominal ext.				
11. Ht. waist				
12. Ht. bust				
13. Ht. cervicale				
14. Ht. crotch				
15. Ht. ankle				
16. Ht. tibiale				
17. Crotch L. total				
18. Crotch L. ant.				
19. G. sit. spread				
20. G. knee, bent				
21. G. ankle				
22. G. leg min.				
23. W. chest, ant.				
24. L. waist, ant.				
25. W. chest, post.				
26. L. waist, post.				
27. G. chest, scye				
28. Depth scye				
29. Back arc hips				
30. Arc bust, ant.				

31. G. bust				
32. G. waist				
33. Arc waist, ant.				
34. L. arm, ant.				
35. G. armscye				
36. G. upper arm				
37. G. elbow				
38. G. forearm				
39. G. wrist				
40. L. neck to bust				
41. L. cerv. to waist				
42. L. shldr. to waist				
43. W. highest bust lev.				
44. Shoulder length				
45. L. arm, shldr. to scye				
46. L. arm, post. upper				
47. L. arm, post. total				
48. Trunk line				
49. Waist to hips				
50. G. hips				
51. G. thigh				
52. G. thigh (midway)				
53. G. calf				
54. G. knee, tibiale				
55. G. trunk, vertical				
*56.**G. hips				
*57.**G. abdominal ext.				
*58.**G. waist				
*59.**G. bust				

*To be taken over foundation garments.

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It became apparent early in the study that too many young women were being measured, because older women were reluctant to participate. Although a special effort was made to obtain the cooperation of older women, it was never possible to get the desired proportion of this group. Three steps were taken to correct this lack of balance. First, 1,273 schedules of single women under 30 years of age were eliminated from the group being analyzed. Second, of the schedules received after May 19, only those of women 45 and over were included in the analysis. Third, if possible, schedules of women 60 years old and over were corrected and included in the analysis even though gross errors were found in the editing process. The distributions by age, weight, stature, bust girth, and hip girth of the 2,664 women excluded from the analysis are shown in table 35.

Even after these steps were taken, the distribution by age of the women measured does not conform perfectly to that of all white women in the Nation, but the discrepancies are no longer great. The question of the representativeness of the sample is discussed in the next section.

Table 1.—*Number of schedules received from field, number excluded from the analysis for different reasons, and number included in the analysis, by State*

State	Number of schedules—										
	Received from field	Rejected because—							Accepted for card punching		
		Woman nonwhite	Age of woman unknown	Woman under 18 years	Woman deformed	One or more measurements omitted	Gross error made in measurement	Total	Excluded from analysis [1]	Included in analysis	Total
Arkansas	1,938		2	66	2	2	207	279	179	1,480	1,659
California	3,882	7	9	105		9	505	635	1,128	2,119	3,247
District of Columbia	1,677		14	28			109	151	284	1,242	1,526
Illinois	1,050	16		7			113	136	25	889	914
Maryland	695			26	1		37	64	109	522	631
New Jersey	2,540	1	5	26	2	2	330	366	55	2,119	2,174
North Carolina	1,066			1			55	56	422	588	1,010
Pennsylvania	1,850			34		1	270	305	462	1,083	1,545
All States	14,698	24	30	293	5	14	1,626	1,992	2,664	10,042	12,706

[1] These schedules were received too late for inclusion, or were excluded to bring about a distribution by age and marital status approximating that of all white women in the United States.

Appraisal of the Sample

The important question of the representativeness of the sample of the 10,042 women included in this study must now be considered. Broadly speaking, a sample may be called representative if it leads to results not materially different from those that would have been obtained had the entire population been analyzed. Applying this definition to the present report, the question becomes: Are the results in this report (based on 10,042 women) essentially the same as those that would have been obtained had all 40 million white women in the United States been measured?

As far as the size of the sample is concerned, if the sample were truly random so that the laws of probability could be applied, chance errors to be expected in a sample as large as 10,000 certainly do not affect the conclusions drawn in this report.

Randomness, however, could not be approximated closely in the selection of the women to be measured. No rigid procedure for selecting women for measurement could be prescribed by the Washington office. Each State had to be left largely to its own devices. Under these circumstances, it was essential to obtain information from each woman measured which, when totaled for all women in the sample, could be checked against corresponding data from the Population Census and other sources of information on all white women in the United States. This was one principal reason for obtaining on each schedule information on age, State, habitat, nativity, marital status, occupation, and family income. For the 10,042 women on which the analysis is based, table 21 shows the distributions by these characteristics.

A comparison of this table with the United States Census and other data reveals some biases. The regional distribution of the women measured is fairly good except that the Middle West and Rocky Mountain areas are underrepresented. Far too many of the women, however, are from urban areas, and the foreign-born element is somewhat underrepresented in comparison with Census figures. Single women have more than their proportionate representation. It is impossible at present to check the distribution of women by number of children borne.[5] Too few of the women are in the "at home" group, and too many are on Work Projects Administration projects. The representation according to income seems to be fairly good, although the higher income groups may be underrepresented among older women.[6]

To what extent do these facts result in lack of representativeness for the sample as a whole? Clearly a bias will result only insofar as the distributions of the measurements of these different groups of women are different. If, for example, the distribution by stature of women in urban areas is the same as for women in rural areas, then the results obtained for stature will be the same regardless of how many rural and how many urban women are measured.

From tables 22 through 27 it appears that age is the only factor affecting five basic measurements enough so that, if it is neglected in the choice of the sample, serious error will result. Since the sample is fairly well balanced by age, in comparison with the Census of 1930,[7] it may be said that, for the five measurements of weight, stature, and bust, waist, and hip girths, the means shown in table 2 differ only slightly from the averages that would have been obtained from a sample properly balanced according to age, State, habitat, nativity, marital status and number of children borne, occupation, and family income. That this conclusion is valid—not only for these five measurements but also for the remaining 54—follows from the fact that these five measurements determine rather completely the size and shape of a woman.

So much for the means; but what about the standard deviations and correlation coefficients? Since time was not available for the computation of these statistical measures for the separate groups, it is necessary to rely on the indirect argument that, in most anthropometric studies, standard deviations and correlations vary less from one group to another than do means. This argument is not entirely an empirical one, since the correlations among measurements are due in considerable measure to intrinsic anthropometric relationships.

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[5] The 1940 census is the first to contain this information, and tabulations of these data were not available when this report was prepared.

[6] This comparison is based upon data in Consumer Incomes in the United States, National Resources Committee, August 1938, and on data to be published in a later report by the National Resources Planning Board.

[7] For the methods used to balance the sample by age, see page 25.

Table 2.—*Means, medians, modes, standard deviations, and coefficients of variation of 59 measurements of 10,042 women*

Item number and measurement	Mean	Median	Mode	Standard deviation	Coefficient of variation
	Pounds	*Pounds*	*Pounds*	*Pounds*	*Percent*
1. Weight	133.48	128.72	120.00	25.98	19.5
Vertical measurements:	*Inches*	*Inches*	*Inches*	*Inches*	
2. Stature	63.16	63.19	63.23	2.48	3.9
3. Cervicale height	54.32	54.34	54.75	2.30	4.2
4. Bust height	45.05	45.09	44.83	2.31	5.1
5. Waist height	40.05	40.04	39.96	1.95	4.9
6. Abdominal-extension height	36.27	36.30	36.45	1.94	5.3
7. Hip height	31.61	31.61	31.89	1.78	5.6
8. Sitting-spread height	29.03	29.05	28.90	1.79	6.2
9. Crotch height	28.53	28.52	28.43	1.74	6.1
10. Tibiale height	17.22	17.23	17.29	1.07	6.2
11. Ankle height	2.98	2.97	2.98	.28	9.4
12. Total posterior arm length	23.00	23.00	23.20	1.17	5.1
13. Upper posterior arm length	13.28	13.27	13.27	.76	5.8
14. Anterior arm length	16.61	16.61	16.56	1.13	6.8
15. Sitting height	24.60	24.61	24.62	1.19	4.9
16. Vertical trunk girth	60.08	59.73	58.82	3.32	5.5
17. Cervicale to waist anterior	19.10	19.07	18.88	1.10	5.7
18. Anterior waist length	12.89	12.87	12.91	.89	6.9
19. Shoulder to waist	15.60	15.56	15.50	1.04	6.6
20. Neck to bust	11.03	10.85	10.58	1.50	13.6
21. Posterior waist length	14.97	14.93	14.86	.93	6.2
22. Scye depth	7.77	7.71	7.60	.84	10.8
23. Trunk line	7.64	7.63	7.57	.91	12.0
24. Arm length, shoulder to scye	5.48	5.44	5.40	.68	12.4
25. Waist to hip	9.03	9.01	9.04	.94	10.4
26. Total crotch length	29.66	29.37	28.63	2.47	8.3
27. Anterior crotch length	14.52	14.36	14.12	1.53	10.6
Horizontal measurements:					
28. Chest girth at armscye	34.77	34.17	33.30	3.20	9.2
29. Bust girth	35.62	34.79	33.69	3.87	10.9
30. Waist girth	29.15	27.93	25.86	4.45	15.3
31. Abdominal-extension girth	36.20	35.25	33.41	4.71	13.0
Horizontal measurements—Con.	*Inches*	*Inches*	*Inches*	*Inches*	*Percent*
32. Hip girth	38.82	38.35	37.81	3.34	8.6
33. Sitting-spread girth	38.62	38.04	37.05	3.91	10.1
34. Maximum thigh girth	22.24	22.05	21.89	2.25	10.1
35. Midway thigh girth	19.57	19.38	18.82	2.03	10.4
36. Bent knee girth	14.29	14.14	13.88	1.38	9.7
37. Knee girth at tibiale	13.96	13.81	13.61	1.27	9.1
38. Maximum calf girth	13.45	13.34	13.02	1.20	9.0
39. Minimum leg girth	8.30	8.25	8.22	.69	8.3
40. Ankle girth	9.31	9.25	9.16	.67	7.2
41. Neck-base girth	15.27	15.20	15.17	.93	6.1
42. Armscye girth	16.10	15.89	15.57	1.55	9.6
43. Upper-arm girth	11.37	11.14	10.54	1.51	13.2
44. Elbow girth	10.35	10.25	10.13	.88	8.5
45. Forearm girth	9.75	9.65	9.50	.84	8.7
46. Wrist girth	6.01	6.00	5.95	.38	6.4
47. Shoulder length	4.64	4.62	4.63	.49	10.6
48. Anterior chest width	12.47	12.42	12.30	.90	7.2
49. Highest bust-level width	7.36	7.32	7.25	.81	11.0
50. Posterior chest width	13.39	13.31	13.26	1.22	9.1
51. Anterior bust arc	20.08	19.61	19.11	2.67	13.3
52. Anterior waist arc	16.52	15.79	14.71	2.88	17.4
53. Abdominal-extension arc	19.67	19.11	18.35	2.70	13.7
54. Posterior hip arc	19.17	18.96	18.48	1.93	10.1
55. Bust girth over foundation garment [1]	35.65	34.81	33.69	3.91	11.0
56. Waist girth over foundation garment [1]	29.19	27.96	25.88	4.46	15.3
57. Abdominal-extension girth over foundation garment [1]	36.14	35.22	33.38	4.64	12.8
58. Hip girth over foundation garment [1]	38.80	38.31	37.81	3.36	8.7
Angle:	*Degrees*	*Degrees*	*Degrees*	*Degrees*	
59. Shoulder slope	23.08	23.22	24.11	4.13	17.9

[1] When the woman did not wear a foundation garment, the corresponding skin measurement was substituted.

Distribution of Body Measurements

The Nation's 40 million white women 18 years old and over, who have to be fitted by the ready-made clothing industry and the dressmaker, present, as everyday observation testifies, an almost bewildering variety of shapes and sizes. Nor can this variability be described completely by one or even a few measurements, since women do not yield to so simple a classification. A surprisingly large proportion of women, as will be seen from the tables in this section, are short but stout or tall but slender. Again, women with the same girth of bust frequently differ by as much as 5 or 6 inches in hip girth.

Satisfactory garment sizing must be based upon accurate information regarding body types. The results presented here offer, for the first time, an opportunity to study the relationships which exist among the body measurements of a large group of women and which may give a clue to such a classification. Therefore one of the first steps in the analysis of the data was to obtain a general view of the extent of variation and the relationships which exist among measurements.

Three kinds of averages, the mean, the median, and the mode were calculated from the frequency distributions (see tables 2 and 36). It will be noted that the mean stature is a little over 5 feet 3 inches (fig. 4) and the mean weight 133½ pounds, figures which differ only slightly from those found by the life insurance companies after allowance is made for clothing and shoes included in the latter figures.[8]

The median—that is, the value of each measurement which divides the range of measurements so that one-half the women measure more and one-half less than the given value—is almost identical with the mean for many of the vertical measurements. For the horizontal measurements, however, the medians are somewhat less than the means. In weight, the difference is about 5 pounds.

The mode—that is, the value that occurs more often than any other, or in other words, the value at which the frequency distribution reaches its maximum—is almost identical with the mean and the median for many of the vertical measurements. For all but one of the horizontal measurements, on the other hand, the modes are less than either the means or the medians. The modal weight is 120 pounds, or 10 percent lower than the mean.

From the point of view of the clothing designer, however, the measurements of the average woman are of limited usefulness. The Nation's women vary far too much in size to be properly fitted by garments made for the average woman. From figure 5, showing four of the frequency distributions, it is possible to gain by inspection some idea of the amount of scatter about the average. The distribution of women by stature is almost perfectly symmetrical and is less variable than either of the girths shown in the chart. The other three distributions are skewed to the right. Weight is most skewed and girth of hips least. Weight is not comparable to the other three in variability since it is measured in pounds.

A numerical measure of the amount of scatter is provided by the standard deviation, or root-mean-square deviation, from the mean—shown for all 59 measurements in table 2. The coefficient of variation, the ratio of the standard deviation to the mean, measures relative variation. It will be seen in the table that of the 53 skin measurements reported in inches, the 7 trunk girths—chest at seye, bust, waist, abdominal extension, hip girth, sitting spread, and trunk vertical—are the most variable. Girth of waist, which ranks highest among the 7, shows, however, a distinctly smaller relative variation than either weight or slope of shoulder.

It will also be seen in table 2 that, with the tabulation procedure used, there is almost no difference between corresponding skin and foundation garment measurements as regards mean, median, mode, standard deviation, and coefficient of variation. The principal reason for this uniformity of measurements is that when a woman did not wear a foundation garment, the skin measurement was substituted in the tabulation for the "over foundation garment" measurement. This was done in order to secure these girth measurements for the entire sample as the women would present themselves to be fitted for clothing. Since less than 15 percent of the women measured wore foundation garments, over 85 percent of them were tabulated as having identical skin and foundation garment measurements. Distributions of women wearing and not wearing foundation garments are shown in table 36.

[8] Association of Life Insurance Medical Directors and the Actuarial Society of America. Medico-actuarial mortality investigation. 5 vols. New York. 1912–1915.

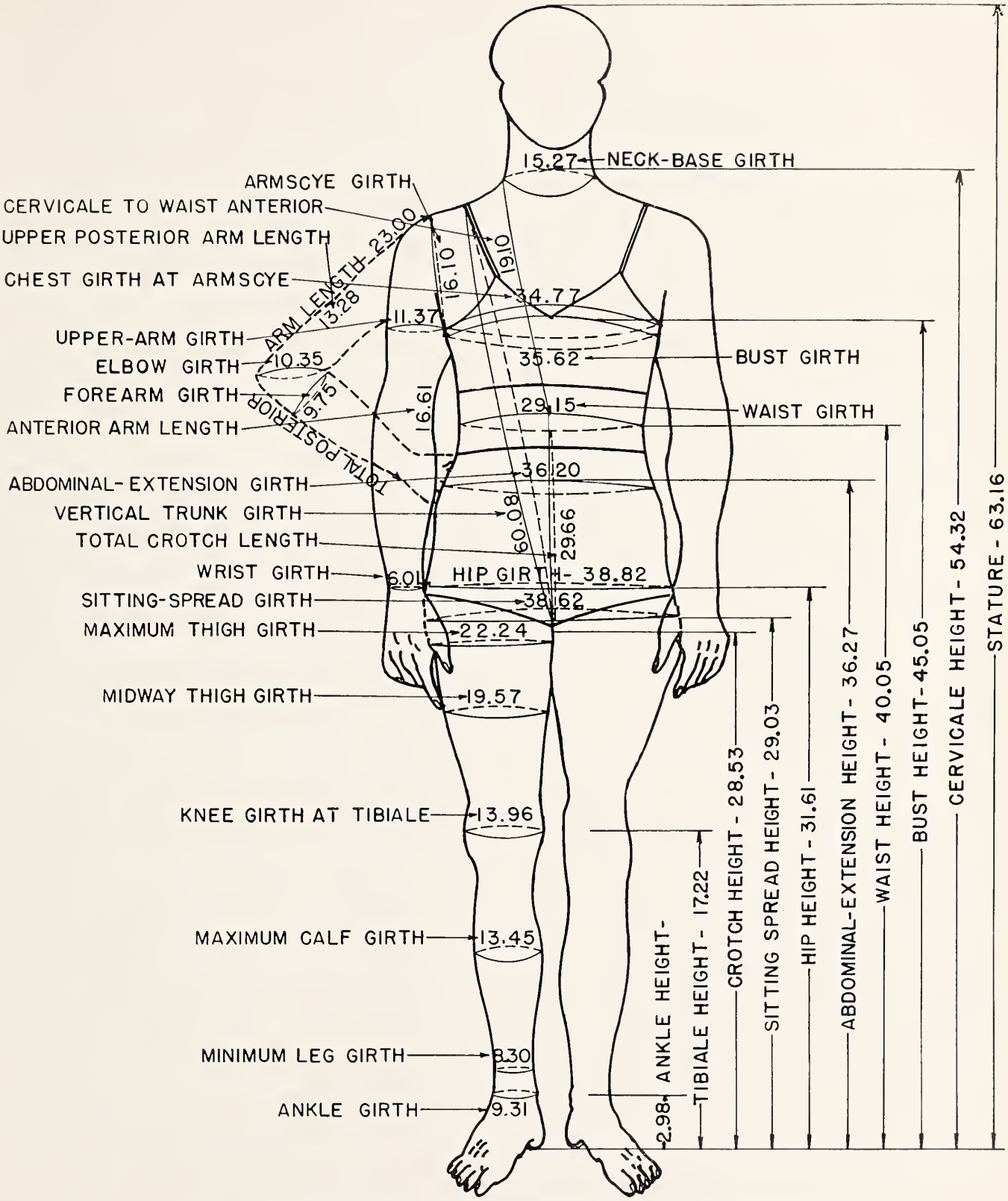

FIGURE 4.—The average (arithmetic mean) woman, showing 34 measurements (in inches).

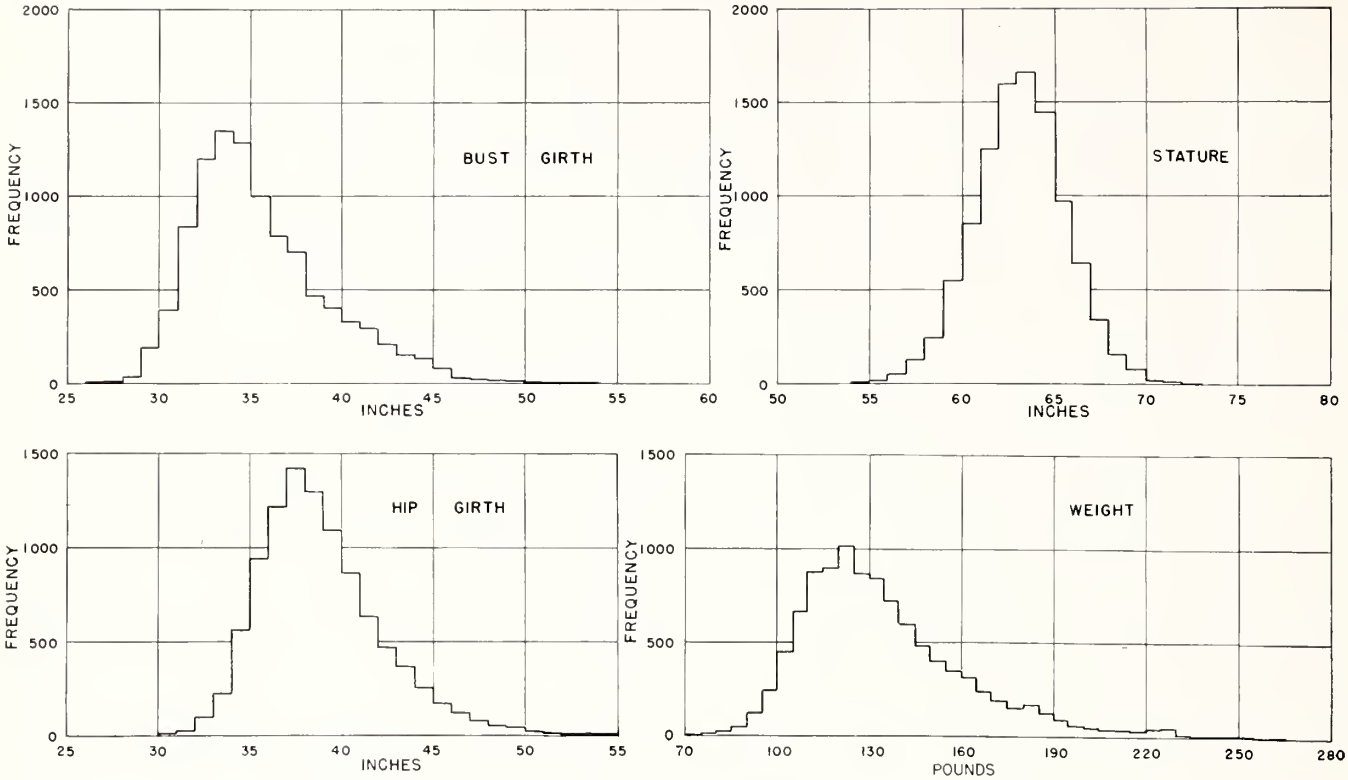

FIGURE 5.—Frequency distributions of 4 measurements of 10,042 women.

Correlations Among Measurements

Of no less significance than the means and standard deviations are the measures of covariation—that is, the extent to which variations in one measurement tend to be accompanied by variations in other measurements.

The two-way, or bivariate, distribution of 10,042 women by girth of hips and girth of bust is given in figure 6. (See also tables 37 to 44, inclusive for other bivariate distributions.) This chart shows that women with large busts tend to have large hips, and conversely. The relation, however, is perhaps not as close as might be expected.

Figure 7, giving the bivariate distribution of the same 10,042 women by girth of bust and stature, shows that these two measurements are almost entirely unrelated. Short women have almost the same average bust girth as tall women, and women with small busts average very nearly the same in height as those with large busts.

The correlation coefficient, which affords a numerical measure of the degree of relationship between measurements, is shown for all possible pairs of the 59 measurements in table 3 (in pocket on back of cover). The table is based on the measurements of 4,128 women.[9]

The most striking fact brought out in table 3 is that while the vertical measurements and, to an even greater degree, the horizontal measurements are rather highly correlated among themselves, many of the correlations of vertical with horizontal measurements are very small and some are actually negative. Thus stature is negatively correlated with girth of waist and with girth of upper arm although it has a considerable positive correlation with the girths of such bony parts of the body as the elbow and ankle and even the hips. Weight, although it shows considerable correlation with many of the vertical measurements is much more highly correlated with the girths. Shoulder slope, the only angle measurement included in the survey, is not highly correlated with any other measurement, and shows a negative correlation with most.

[9] Calculation of the entire set of correlations is a laborious process and could not have been completed in the time available after all the schedules were received in Washington. The two most significant sets of these correlations, however, were recomputed for the full sample of 10,042 women. The results, which are shown in tables 5 and 13, differ very little from the corresponding correlations shown in table 3.

The four correlations between the measurements taken over foundation garments and the corresponding skin measurements are all greater than 0.99. Furthermore, each foundation garment measurement has correlations with all other measurements which, for practical purposes, are identical with the correlations for the corresponding skin measurement. For these reasons, it seemed unnecessary to consider both sets of measurements in the sizing systems presented later in this bulletin, hence the foundation garment measurements were omitted.

It must be remembered that the 10,000 women included in this study were of all ages—from 18 to more than 80—and that while the skeleton undergoes little or no change during adult life, external measurements change considerably. Furthermore, a woman born 60 years ago was brought up under quite different conditions from one born only 20 years ago, and it is not inconceivable that body measurements reflect such differences in environment.

Means of seven different heights, six girths, and weight are shown for women in different age groups in figures 8 and 9. (See also table 45.) The heights, of course, show much less change than the girths and weight. Height of bust and height of abdominal extension show the greatest declines—the former, somewhat more than 2 inches in 55 years. Weight, on the other hand, shows a rapid increase of more than 25 pounds up to the 50- to 54-year age group and then a decline. The extent of this decline cannot be estimated accurately because elderly women were not adequately represented in the study; only 60 who had passed their seventieth birthday were measured. The girth measurements show the same tendency as weight, but to varying degrees. Abdominal extension and waist show the greatest increases, more than seven inches, while the hips increased only about half as much.

These differences in body dimensions at different ages offer a partial explanation for the relative sizes of the correlations discussed above. As women grow older, their height measurements decrease while their girths increase; thus when all adult women are considered together, the correlations between heights and girths are lower than is the case for women in any particular age group.

For this reason, the correlations among the 59 measurements, with age held constant, are given in table 4 (in pocket on back of cover).[10] Here it will be seen that nearly all the correlations are positive and that, as expected, the correlations of girths with lengths are considerably greater than in table 3, while those among girths are slightly less.

[10] Because of the curvilinearity of the girth regressions on age, it would seem necessary to hold constant not only age but also the square of age. The second order partial correlations among the girths, where the differences should be greatest, were computed on this basis (see table 46) but show only small differences from the first order partial correlations here presented.

In making a more detailed analysis of the relations among the body measurements of women, it was necessary to reduce the number of correlations since the full set of 1,711 coefficients presented in tables 3 and 4 was too unwieldy. This was done, first, by eliminating 22 of the less important measurements and, second, by considering the remaining 19 girth measurements and weight separately from the 17 heights and lengths, thus eliminating the correlations between the girths and weight on the one hand and the heights and lengths on the other. The

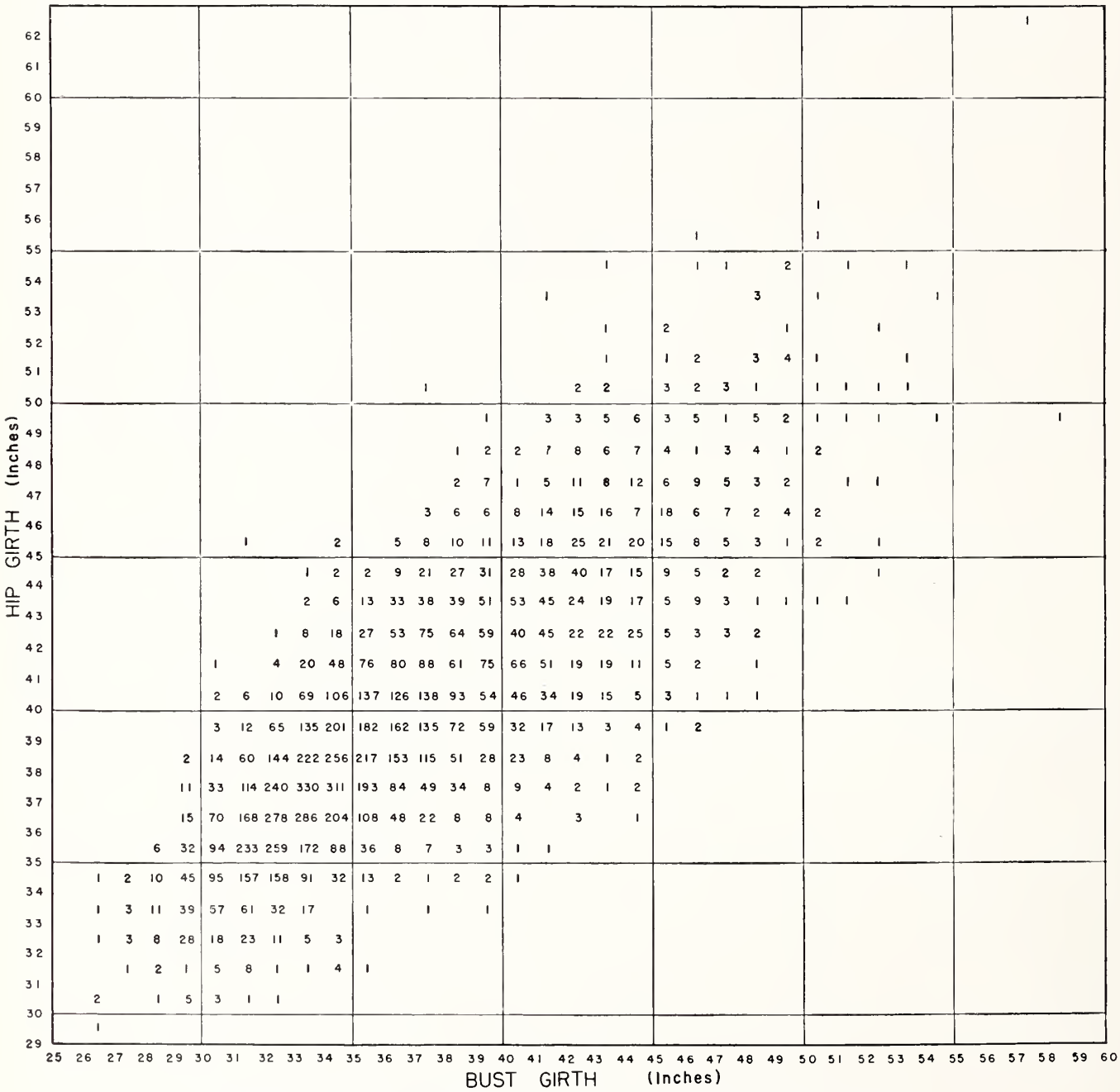

FIGURE 6.—Bivariate distribution of bust girth and hip girth of 10,042 women.

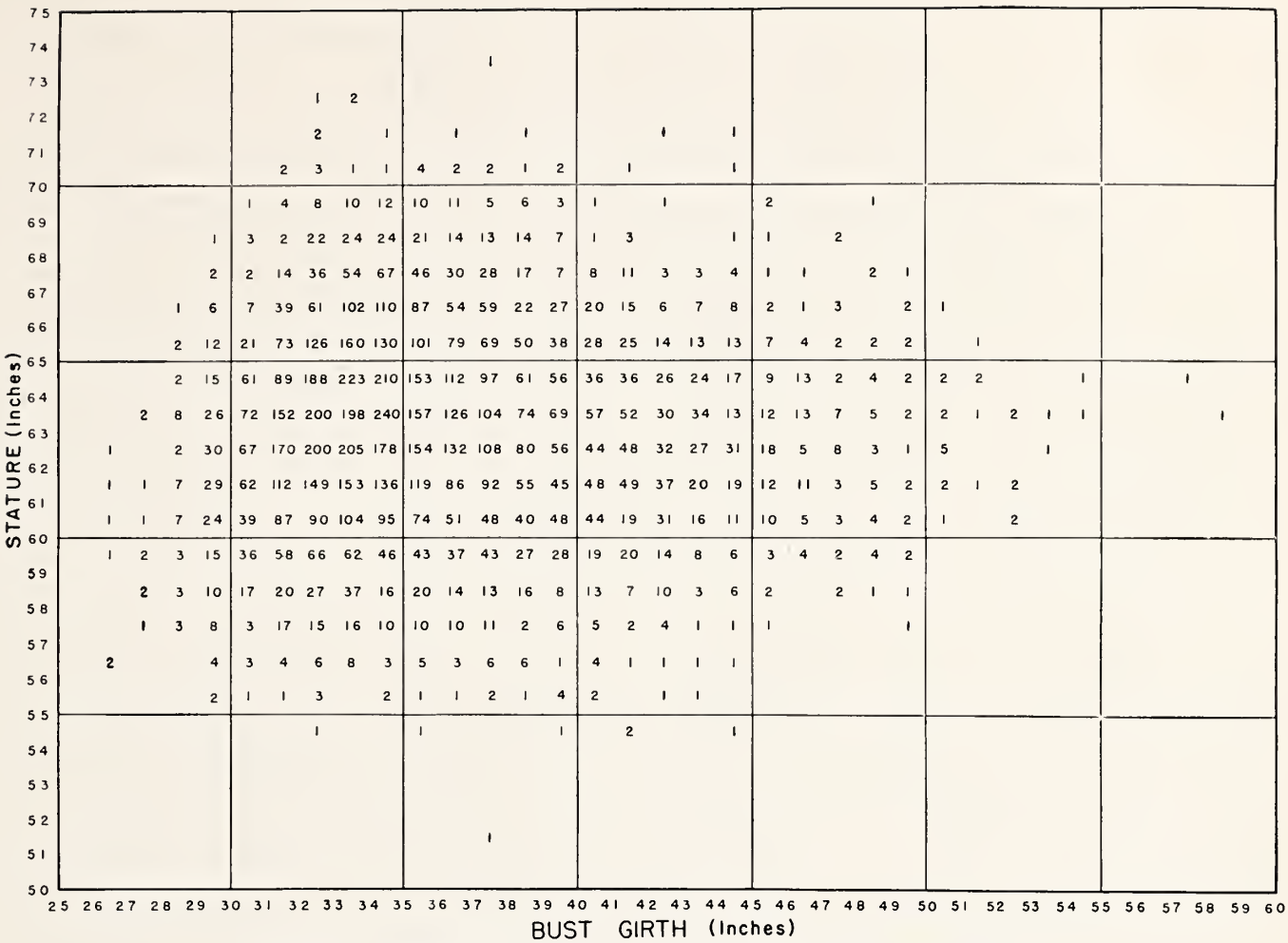

FIGURE 7.—Bivariate distribution of bust girth and stature of 10,042 women.

second step seemed justified because of the generally low correlations which had been found between horizontal and vertical measurements.

All the tables presented in the following two sections are based on the full sample of 10,000 women.

Horizontal Measurements

The simple correlations among the girths shown in table 5 for 10,000 women have already been shown in table 3 for 4,000 women. The differences are comparatively small. Some important points, however, which were obscured by the size and scope of the earlier table, are now apparent. First, the correlations among the six trunk girths are surprisingly high, the lowest being 0.79, and the correlations of weight with these trunk girths average even higher, the lowest being 0.88. Second, of these seven measurements, weight, hip girth, and sitting spread show the highest correlations with the leg girths. For neck base, armscye, and the forearm girths, on the other hand, weight, chest, and bust show the highest correlations. It is evident, therefore, that the lower body girths are related most closely with the legs, and upper body girths with the arms, while weight alone is highly correlated with all the measurements.

Furthermore, measurements taken close together on the body tend to be highly correlated. Thus the three highest correlations in the entire set are girths of chest and bust, waist and abdominal extension, and hip and sitting spread. Also there is a perceptible tendency for measurements of bony parts of the body to be highly correlated with measurements of other bony parts and likewise for measurements of the soft parts of the body. Thus the correlation between wrist and ankle is 0.60 and between forearm and calf 0.72; whereas for wrist and calf the figure is only 0.56, and for forearm and ankle 0.52. As a group, the correlations of the leg girths with neck base, armscye, and the arm girths are the lowest of the girth correlations.

In interpreting these correlations, however, the question naturally arises: Are the regressions among

Table 5.—*Correlations among weight and 19 girth measurements of 10,042 women*

Measurement	Chest girth at armscye	Bust girth	Waist girth	Abdominal-extension girth	Hip girth	Sitting spread girth	Maximum thigh girth	Midway thigh girth	Bent knee girth	Knee girth at tibiale	Maximum calf girth	Minimum leg girth	Ankle girth	Neck-base girth	Armscye girth	Upper-arm girth	Elbow girth	Forearm girth	Wrist girth
Weight	.8915	.8981	.8771	.8990	.9190	.8984	.8725	.8176	.7743	.7694	.7760	.6266	.5629	.6744	.8235	.8765	.7572	.8326	.6681
Chest girth at armscye		.9397	.8891	.8601	.8023	.7881	.7486	.6945	.6390	.6328	.6328	.4941	.4621	.6691	.8191	.8705	.7095	.7846	.6140
Bust girth			.9177	.8845	.8091	.7961	.7463	.6920	.6375	.6324	.6321	.4866	.4512	.6472	.8131	.8710	.6918	.7654	.5921
Waist girth				.9305	.8105	.8045	.7175	.6524	.6224	.6272	.5946	.4826	.4491	.6332	.8058	.8542	.6672	.7244	.6001
Abdominal-extension girth					.8722	.8688	.7842	.7122	.6577	.6641	.6200	.4959	.4516	.5988	.8036	.8543	.6662	.7281	.5927
Hip girth						.9371	.9077	.8292	.7461	.7496	.7369	.5947	.5192	.5769	.7547	.8302	.6932	.7644	.5926
Sitting-spread girth							.8898	.8283	.7389	.7375	.7241	.5693	.4893	.5508	.7469	.8107	.6627	.7394	.5657
Maximum thigh girth								.8987	.7391	.7499	.7560	.5811	.4719	.5366	.7105	.8081	.6699	.7580	.5346
Midway thigh girth									.7403	.7450	.7649	.5862	.4760	.5102	.6417	.7535	.6265	.7284	.5179
Bent knee girth										.8534	.7666	.6570	.5920	.5061	.6104	.6679	.6329	.6806	.5897
Knee girth at tibiale											.7596	.6679	.5597	.5002	.6084	.6773	.6258	.6814	.5740
Maximum calf girth												.7432	.5857	.4877	.5782	.6595	.6302	.7162	.5638
Minimum leg girth													.7050	.4026	.4791	.5104	.5420	.5952	.6094
Ankle girth														.3926	.4605	.4335	.4968	.5152	.5961
Neck-base girth															.5990	.6169	.5518	.6010	.4973
Armscye girth																.8354	.6993	.7515	.6264
Upper-arm girth																	.7301	.8198	.6005
Elbow girth																		.8393	.6291
Forearm girth																			.6713

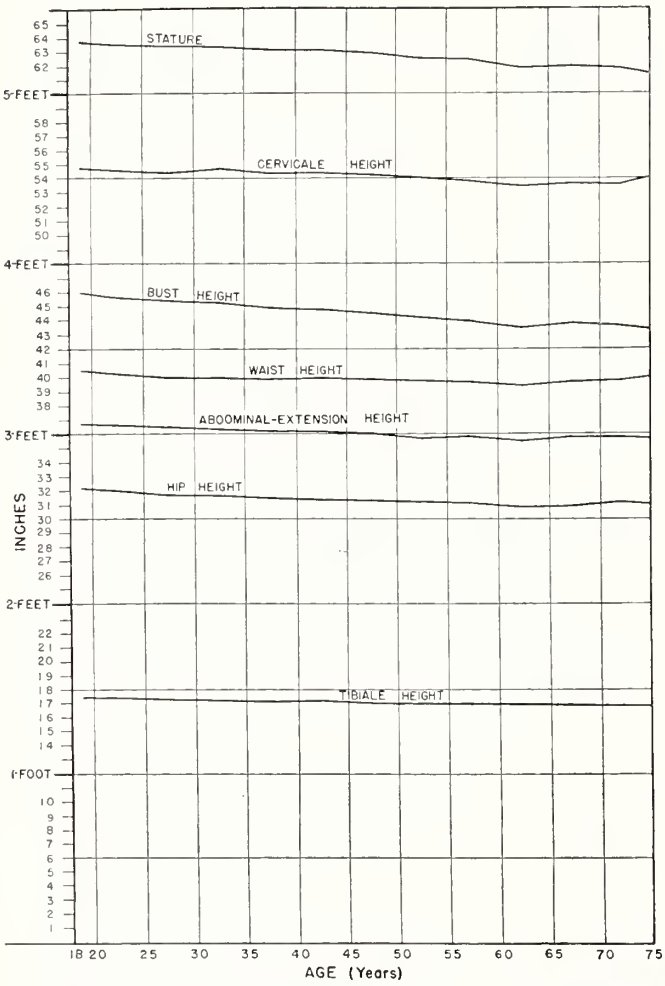

FIGURE 8.—Average height measurements of women, by age.

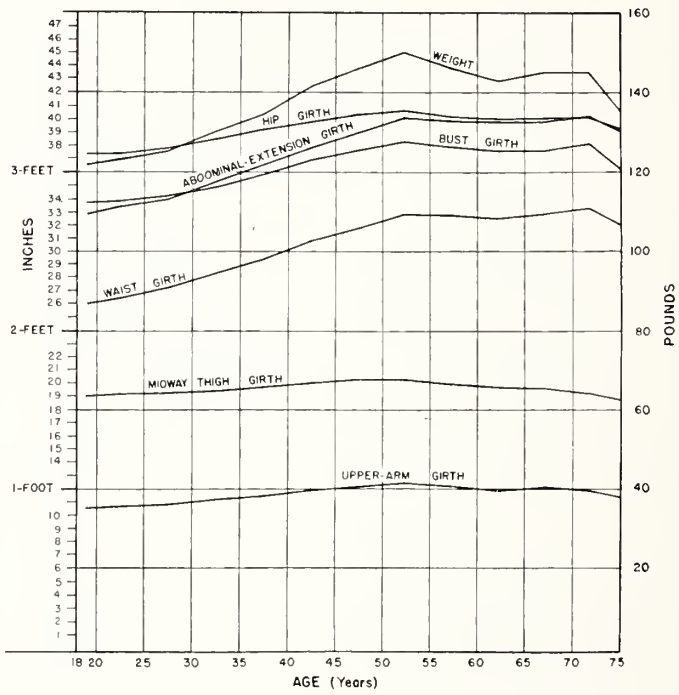

FIGURE 9.—Average girth measurements and weight of women, by age.

all these measurements linear or approximately so? If they are not, the correlation coefficients lose much of their meaning.

To answer this question, a large number of broken-line regressions for 1-centimeter intervals were plotted for samples of 2,000 and 4,000 cases. Very few of these graphs showed departures from linearity

which could not be ascribed to chance. For the full sample of 10,000, moreover, averages were obtained (1) for each of the 21 measurements for 5-pound intervals of weight and (2) for each of 12 measurements for 1-inch intervals of hip girth and for 1-inch intervals of bust girth. All these averages are shown in tables 47, 48, and 49, and some of them are graphed in figures 10, 11, and 12. On the basis of this evidence, the conclusion seems justified that among the girth measurements, departures from linearity of regression, while they do exist, are not at all serious and that analysis of the linear correlations is all that is required.

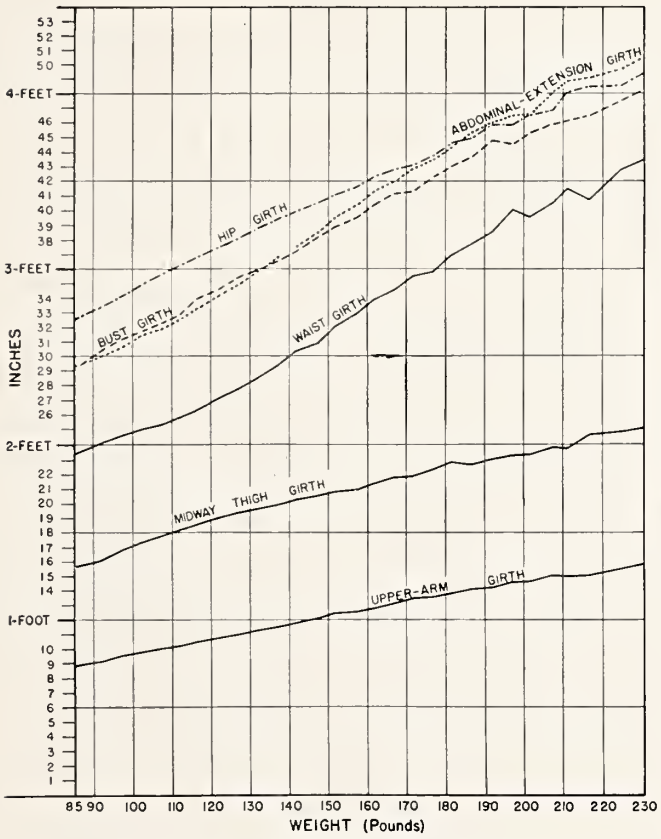

FIGURE 10.—Average girth measurements of women, by weight.

The first and second principal components of the girth measurements also were computed, and the correlations of these components with each of the 20 measurements are shown in table 6. The first principal component, it may be remembered, is that linear combination of the variables which is most highly correlated with the whole set of variables, in the sense that the sum of the squares of the correlation of the principal component with each variable is greater than (or at least as great

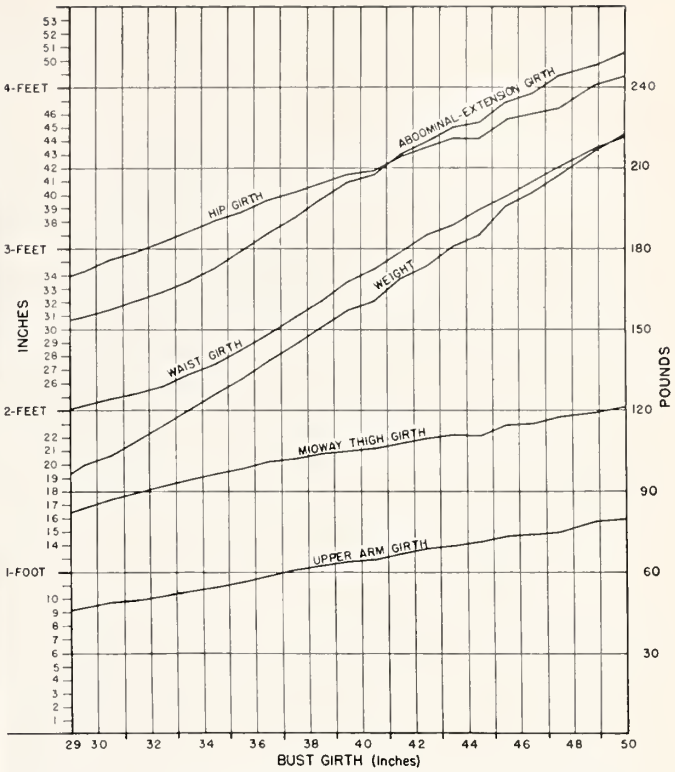

FIGURE 11.—Average girth measurements and weight of women, by bust girth.

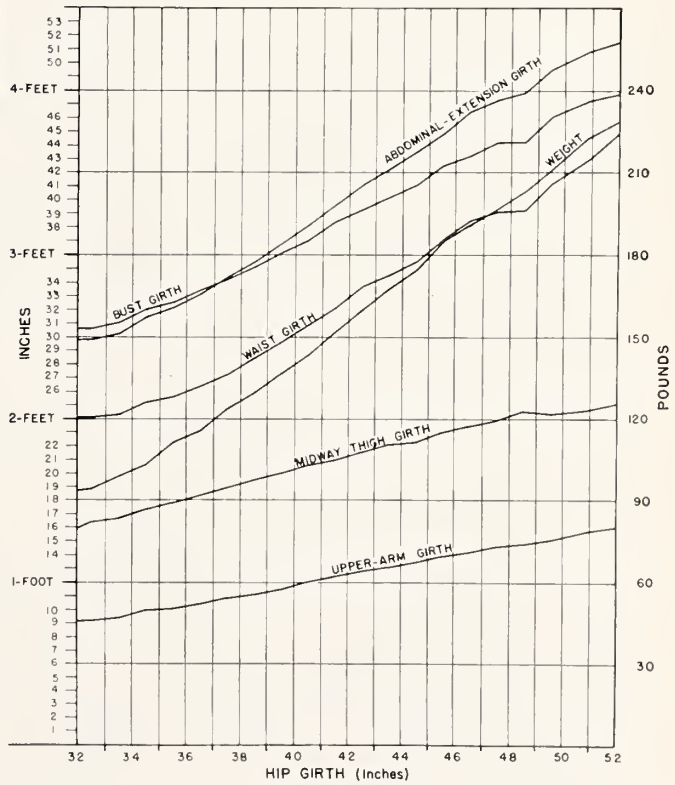

FIGURE 12.—Average girth measurements and weight of women, by hip girth.

Table 6.—*First and second principal components of weight and 19 girth measurements of 10,042 women*

Measurement	Correlation with—	
	First principal component	Second principal component
Weight	.9710	−.0756
Chest girth at armscye	.8973	−.2955
Bust girth	.8960	−.3154
Waist girth	.8813	−.3259
Abdominal-extension girth	.8993	−.2696
Hip girth	.9266	−.0612
Sitting-spread girth	.9100	−.0630
Maximum thigh girth	.8933	.0052
Midway thigh girth	.8515	.0959
Bent knee girth	.8228	.2847
Knee girth at tibiale	.8213	.2890
Maximum calf girth	.8148	.3452
Minimum leg girth	.6923	.5520
Ankle girth	.6193	.5143
Neck-base girth	.6851	−.1665
Armscye girth	.8492	−.2461
Upper-arm girth	.9064	−.2444
Elbow girth	.8054	−.0009
Forearm girth	.8773	−.0112
Wrist girth	.7207	.1861
Proportion of variation accounted for by each component	*.7087*	*.0712*

as) is the case for any linear combination of the measurements.

The first principal component of the girths is in this sense the best determinant of the set of girths as a whole, and the correlation of each measurement with the first component indicates roughly how nearly the measurement approaches this theoretically perfect combination. Weight shows by far the highest correlation, and indeed 0.97 is so close to unity that from this point of view it may be said that weight is about as perfect an indicator of the girth measurements of women as any single index that could be constructed. The next highest correlation is 0.93 for girth of hips. Girth of sitting spread, 0.91, ranks third, closely followed by remaining trunk girths, thigh maximum, and upper arm.

The second principal component is negatively correlated with the girths of the upper parts of the body and arm and positively correlated with the leg girths and wrist. Weight and the intermediate girths have only small correlations with this component. From these results, it may be surmised that among women of the same size (as measured by the first principal component of the girths) there is considerable positive correlation among the upper girths and among the leg girths with negative correlations between upper girths and leg girths.

The partial correlations holding constant not the first principal component but weight, as shown in table 7, confirm this inference. The negative correlations, however, are not very large, the greatest being −0.28 between calf and waist and between calf and abdominal extension. The positive correlations range up to 0.70 between chest and bust.

For comparison with these figures, the partial correlations holding girth of bust constant and those holding girth of hips constant are shown in tables 8 and 9. These correlations are, almost without exception, larger than those when weight is held constant. With girth of bust constant there are no negative correlations, and with girth of hips constant only a few are negative, while in both cases the largest positive correlation is greater than 0.80. The conclusion to be drawn from these facts is the same as that above, namely, that weight is a better indicator of the 20 measurements under consideration than either girth of bust or girth of hips, for it renders closer to zero the correlations among the remaining measurements.

Before accepting this conclusion too unreservedly, however, it will be well to inquire whether a different

Table 7.—*Partial correlations among 19 girth measurements of 10,042 women, with weight constant*

Measurment	Bust girth	Waist girth	Abdominal-extension girth	Hip girth	Sitting-spread girth	Maximum thigh girth	Midway thigh girth	Bent knee girth	Knee girth at tibiale	Maximum calf girth	Minimum leg girth	Ankle girth	Neck-base girth	Armscye girth	Upper-arm girth	Elbow girth	Forearm girth	Wrist girth
Chest girth at armscye	.6979	.4925	.2958	−.0954	−.0641	−.1318	−.1317	−.1788	−.1835	−.2064	−.1826	−.1061	.2028	.3307	.4089	.1164	.1689	.0547
Bust girth		.6152	.4002	−.0942	−.0555	−.1739	−.1669	−.2083	−.2087	−.2339	−.2224	−.1495	.1277	.2945	.3960	.0410	.0721	−.0242
Waist girth			.6747	.0230	.0785	−.2037	−.2339	−.1866	−.1553	−.2842	−.1791	−.1124	.1175	.3063	.3694	.0096	−.0222	.0395
Abdominal-extension girth				.2661	.3182	−.0011	−.0903	−.1386	−.0985	−.2814	−.1974	−.1504	−.0234	.2545	.3146	−.0508	−.0843	−.0243
Hip girth					.6436	.5495	.3428	.1382	.1688	.0951	.0613	−.0217	−.1477	−.0095	.1301	−.0104	.0039	−.0729
Sitting-spread girth						.4940	.3708	.1558	.1652	.0973	.0187	−.0450	−.1699	.0285	.1100	−.0610	−.0351	−.1054
Maximum thigh girth							.6590	.2054	.2518	.2560	.0904	−.0477	−.1437	−.0290	.1842	.0291	.1165	−.1329
Midway thigh girth								.2945	.3152	.3593	.1649	.0333	−.0969	−.0966	.1333	.0198	.1497	−.0660
Bent knee girth									.6374	.4153	.3484	.2987	−.0345	−.0758	−.0354	.1129	.1026	.1538
Knee girth at tibiale										.4034	.3733	.2399	−.0396	−.0694	.0096	.1037	.1153	.1263
Maximum calf girth											.5227	.2855	−.0766	−.1702	−.0680	.1034	.2005	.0966
Minimum leg girth												.5470	−.0347	−.0833	−.1033	.1327	.1704	.3290
Ankle girth													.0212	−.0065	−.1504	.1307	.1018	.3577
Neck-base girth														.1040	.0725	.0852	.0965	.0850
Armscye girth															.4161	.2044	.2096	.1807
Upper-arm girth																.2112	.3375	.0418
Elbow girth																	.5773	.2535
Forearm girth																		.2792

Table 8.—*Partial correlations among weight and 18 girth measurements of 10,042 women, with bust girth constant*

Measurement	Chest girth at armseye	Waist girth	Abdominal-extension girth	Hip girth	Sitting-spread girth	Maximum thigh girth	Midway thigh girth	Bent knee girth	Knee girth at tibiale	Maximum calf girth	Minimum leg girth	Ankle girth	Neck-base girth	Armseye girth	Upper-arm girth	Elbow girth	Forearm girth	Wrist girth
Weight	.3157	.3028	.5099	.7444	.6889	.6910	.6175	.5955	.5913	.6114	.4935	.4017	.2779	.3643	.4360	.4278	.5131	.3846
Chest girth at armseye		.1968	.1815	.2087	.1931	.2080	.1789	.1517	.1453	.1465	.1234	.1247	.2335	.2767	.3097	.2403	.2972	.2090
Waist girth			.6407	.2911	.3074	.1234	.0605	.1223	.1523	.0471	.1038	.0988	.1297	.2577	.2811	.1125	.0861	.1771
Abdominal-extension girth				.5708	.5833	.3995	.2973	.2611	.2900	.1683	.1609	.1261	.0740	.3107	.3660	.1611	.1702	.1835
Hip girth					.8237	.7768	.6347	.5086	.5227	.4950	.3915	.2768	.1188	.2831	.4346	.3145	.3836	.2397
Sitting-spread girth						.7341	.6348	.4963	.4993	.4710	.3441	.2409	.0770	.2826	.3942	.2562	.3341	.1934
Maximum thigh girth							.7956	.5135	.5391	.5511	.3749	.2275	.1056	.2676	.4833	.3197	.4360	.1728
Midway thigh girth								.5380	.5496	.5855	.3957	.2542	.1132	.1880	.4251	.2834	.4279	.1859
Bent knee girth									.7544	.6091	.5152	.4427	.1592	.2053	.2975	.3450	.3887	.3418
Knee girth at tibiale										.5995	.5323	.3969	.1540	.2090	.3324	.3367	.3959	.3197
Maximum calf girth											.6435	.4345	.1331	.1424	.2862	.3447	.4659	.3035
Minimum leg girth												.6227	.1317	.1643	.2019	.3256	.3963	.4564
Ankle girth													.1478	.1802	.0924	.2865	.2958	.4573
Neck-base girth														.1639	.1420	.1890	.2154	.1856
Armseye girth															.4448	.3254	.3448	.3091
Upper-arm girth																.3594	.4843	.2141
Elbow girth																	.6667	.3771
Forearm girth																		.4206

Table 9.—*Partial correlations among weight and 18 girth measurements of 10,042 women, with hip girth constant*

Measurement	Chest girth at armseye	Bust girth	Waist girth	Abdominal-extension girth	Sitting-spread girth	Maximum thigh girth	Midway thigh girth	Bent knee girth	Knee girth at tibiale	Maximum calf girth	Minimum leg girth	Ankle girth	Neck-base girth	Armseye girth	Upper-arm girth	Elbow girth	Forearm girth	Wrist girth
Weight	.6551	.6672	.5729	.5054	.2699	.2315	.2519	.3376	.3084	.3709	.2525	.2771	.4481	.5023	.5165	.4227	.5120	.3888
Chest girth at armseye		.8283	.6831	.5494	.1742	.0815	.0877	.1017	.0794	.1032	.0354	.1027	.4230	.5455	.6145	.3563	.4453	.2882
Bust girth			.7609	.6221	.1849	.0481	.0644	.0864	.0665	.0904	.0114	.0759	.3759	.5251	.6084	.3092	.3877	.2379
Waist girth				.7802	.2203	−.0739	−.0599	.0456	.0508	−.0066	.0012	.0706	.3463	.5050	.5553	.2495	.2778	.2539
Abdominal-extension girth					.3019	−.0365	−.0401	.0215	.0320	−.0686	−.0578	.0156	.2394	.4528	.4775	.1747	.1947	.1925
Sitting-spread girth						.2680	.2627	.1711	.1519	.1425	.0428	.0372	.0358	.1732	.1679	.0522	.1030	.0370
Maximum thigh girth							.6228	.2214	.2502	.3071	.1225	.0241	.0379	.0923	.2329	.1346	.2371	−.0098
Midway thigh girth								.3270	.3336	.4074	.2073	.1101	.0698	.0434	.2090	.1283	.2626	.0589
Bent knee girth									.6674	.4817	.3984	.3691	.1392	.1084	.1305	.2412	.2571	.2751
Knee girth at tibiale										.4632	.4175	.3114	.1254	.0983	.1490	.2226	.2540	.2435
Maximum calf girth											.5611	.3606	.1134	.0497	.1268	.2451	.3509	.2335
Minimum leg girth												.5808	.0907	.0575	.0373	.2239	.2714	.3968
Ankle girth													.1398	.1336	.0206	.2308	.2258	.4239
Neck-base girth														.3053	.3030	.2580	.3039	.2362
Armseye girth															.5711	.3725	.4128	.3391
Upper-arm girth																.3847	.5152	.2417
Elbow girth																	.6659	.3759
Forearm girth																		.4204

Table 10.—*Partial correlations among weight and 19 girth measurements of 10,042 women, with stature constant*

Measurement	Chest girth at armseye	Bust girth	Waist girth	Abdominal-extension girth	Hip girth	Sitting-spread girth	Maximum thigh girth	Midway thigh girth	Bent knee girth	Knee girth at tibiale	Maximum calf girth	Minimum leg girth	Ankle girth	Neck-base girth	Armseye girth	Upper-arm girth	Elbow girth	Forearm girth	Wrist girth
Weight	.9021	.9183	.9150	.9205	.9219	.9038	.8750	.8201	.7637	.7618	.7689	.6152	.5391	.6634	.8272	.9054	.7506	.8313	.6528
Chest girth at armseye		.9408	.8962	.8615	.8026	.7876	.7483	.6936	.6436	.6339	.6339	.4927	.4646	.6707	.8188	.8742	.7108	.7854	.6177
Bust girth			.9202	.8845	.8139	.7989	.7500	.6947	.6518	.6409	.6405	.4920	.4652	.6558	.8158	.8717	.6995	.7711	.6049
Waist girth				.9326	.8257	.8157	.7305	.6634	.6541	.6496	.6163	.5006	.4832	.6556	.8167	.8543	.6875	.7409	.6304
Abdominal-extension girth					.8781	.8724	.7887	.7156	.6738	.6741	.6291	.5024	.4672	.6077	.8067	.8548	.6745	.7343	.6069
Hip girth						.9368	.9067	.8276	.7439	.7460	.7330	.5882	.5013	.5698	.7527	.8402	.6885	.7611	.5858
Sitting-spread girth							.8890	.8269	.7402	.7362	.7225	.5648	.4849	.5461	.7450	.8175	.6597	.7372	.5622
Maximum thigh girth								.8978	.7379	.7471	.7533	.5752	.4632	.5297	.7081	.8168	.6656	.7550	.5275
Midway thigh girth									.7408	.7432	.7635	.5815	.4699	.5041	.6389	.7607	.6224	.7257	.5122
Bent knee girth										.8490	.7591	.6467	.5697	.4887	.6085	.6920	.6220	.6747	.5706
Knee girth at tibiale											.7528	.6593	.5428	.4861	.6050	.6936	.6163	.6752	.5593
Maximum calf girth												.7366	.5702	.4734	.5742	.6754	.6208	.7108	.5488
Minimum leg girth													.6968	.3872	.4735	.5227	.5312	.5876	.5975
Ankle girth														.3679	.4554	.4575	.4796	.5039	.5744
Neck-base girth															.5953	.6322	.5404	.5931	.4798
Armseye girth																.8421	.6970	.7495	.6248
Upper-arm girth																	.7448	.8315	.6225
Elbow girth																		.8365	.6181
Forearm girth																			.6650

Table 11.—*Partial correlations among 19 girth measurements of 10,042 women, with stature and weight constant*

Measurement	Bust girth	Waist girth	Abdominal-extension girth	Hip girth	Sitting-spread girth	Maximum thigh girth	Midway thigh girth	Bent knee girth	Knee girth at tibiale	Maximum calf girth	Minimum leg girth	Ankle girth	Neck-base girth	Armscye girth	Upper-arm girth	Elbow girth	Forearm girth	Wrist girth	Vertical trunk girth
Chest girth at armscye	.6579	.4062	.1841	−.1737	−.1502	−.1968	−.1872	−.1628	−.1911	−.2165	−.1832	−.0600	.2237	.2992	.3135	.1180	.1477	.0883	.1241
Bust girth		.5008	.2538	−.2126	−.1834	−.2794	−.2574	−.1937	−.2290	−.2590	−.2338	−.0894	.1573	.2523	.2401	.0390	.0348	.0184	.1552
Waist girth			.5730	−.1141	−.0652	−.3592	−.3765	−.1717	−.1814	−.3381	−.1959	−.0297	.1610	.2638	.1513	.0026	−.0881	.1085	.2437
Abdominal-extension girth				.1948	.2418	−.0886	−.1757	−.1157	−.1074	−.3145	−.2074	−.0883	−.0101	.2062	.1290	−.0638	−.1427	.0202	.2050
Hip girth					.6246	.5331	.3229	.1592	.1741	.0977	.0688	.0131	−.1443	−.0456	.0341	−.0136	−.0246	−.0544	.0570
Sitting-spread girth						.4736	.3500	.1868	.1717	.1007	.0261	−.0065	−.1673	−.0109	−.0045	−.0662	−.0597	−.0858	.0591
Maximum thigh girth							.6507	.2228	.2566	.2600	.0965	−.0208	−.1404	−.0581	.1195	.0272	.1024	−.1192	−.0711
Midway thigh girth								.3100	.3194	.3633	.1706	.0577	−.0934	−.1227	.0750	.0180	.1382	−.0533	−.1169
Bent knee girth									.6390	.4164	.3474	.2906	−.0371	−.0641	.0022	.1143	.1109	.1475	−.0812
Knee girth at tibiale										.4034	.3733	.2421	−.0399	−.0694	.0141	.1038	.1164	.1263	−.0415
Maximum calf girth											.5228	.2890	−.0767	−.1722	−.0763	.1034	.2015	.0969	−.1553
Minimum leg girth												.5499	−.0356	−.0800	−.1025	.1332	.1738	.3280	−.0395
Ankle girth													.0163	.0200	−.0855	.1347	.1190	.3487	−.0234
Neck-base girth														.1106	.0993	.0857	.1090	.0824	.0548
Armscye girth															.3906	.2049	.1978	.1993	.2066
Upper-arm girth																.2324	.3340	.0979	.1021
Elbow girth																	.5787	.2559	.0073
Forearm girth																		.2906	.0032
Wrist girth																			.0893

result would have been reached if only women of the same height—say 5 feet 4 inches—had been considered instead of all women regardless of height. This may be done statistically by the method of partial correlation precisely as was done for weight, girth of hips, and girth of bust in the preceding tables. Because the regressions of the girths on stature are not quite linear, this procedure does not give exactly the results desired. The approximation, however, is better than might be suspected, as was proven in the case of age (see footnote 10, page 32).

Table 10 shows the partial correlations among the girths and weights holding stature constant. Upon comparing these correlations with those in table 5, it will be seen that the differences are small. On the whole the correlations are a little higher, particularly those involving weight and those involving girth of waist. These differences, however, are clearly not large enough to alter materially the conclusions drawn from the analysis of the simple correlations.

Part of the analysis showing weight to be the best indicator of girths was carried through for these first order partial correlations on a sample of 2,000 women. The three sets of second order partial correlations holding constant stature and weight, stature and bust girth, and stature and hip girth, were computed. They differ no more from the corresponding first order partial correlations than do the set holding stature constant from the simple correlations, except possibly in the case of stature and weight. The latter set was recomputed for the full sample of 10,000 women. (See table 11.)

One final method of evaluating numerically the superiority of weight over other measurements as an indicator of body girths is provided by table 12. There are shown the simple standard deviations of the 19 girth measurements and the residual standard deviations after eliminating variations due to weight

Table 12.—*Simple standard deviations of weight and 19 girth measurements of 10,042 women, and residual standard deviations after eliminating variation due to each of 5 measurements*

Measurement	Simple standard deviation	Residual standard deviation after eliminating variation due to—				
		Weight	Bust girth	Waist girth	Abdominal-extension girth	Hip girth
	Pounds	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*
Weight	25.98	-------	11.42	12.48	11.38	10.24
Horizontal measurements:	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*
Chest girth at armscye	3.20	1.45	1.09	1.46	1.63	1.91
Bust girth	3.87	1.70	-------	1.54	1.81	2.27
Waist girth	4.45	2.14	1.77	-------	1.63	2.60
Abdominal-extension girth	4.71	2.06	2.20	1.73	-------	2.30
Hip girth	3.34	1.32	1.96	1.96	1.63	-------
Sitting-spread girth	3.91	1.72	2.37	2.32	1.93	1.36
Maximum thigh girth	2.25	1.10	1.50	1.57	1.40	.94
Midway thigh girth	2.03	1.17	1.46	1.54	1.42	1.13
Bent knee girth	1.38	.87	1.06	1.08	1.04	.92
Knee girth at tibiale	1.27	.81	.98	.99	.95	.84
Maximum calf girth	1.20	.76	.93	.97	.94	.81
Minimum leg girth	.69	.53	.60	.60	.60	.55
Ankle girth	.67	.56	.60	.60	.60	.58
Neck-base girth	.93	.68	.71	.72	.74	.76
Armscye girth	1.55	.88	.90	.92	.92	1.01
Upper-arm girth	1.51	.73	.74	.78	.78	.84
Elbow girth	.88	.58	.64	.66	.66	.64
Forearm girth	.84	.47	.54	.58	.58	.54
Wrist girth	.38	.28	.31	.31	.31	.31

and to each of four trunk girths in turn. It is apparent that the standard deviations after eliminating weight are on the whole less than those after eliminating any of these girths. It should be noted, however, that the variations remaining, even after weight is eliminated, are quite large.

Vertical Measurements

In the choice of vertical measurements to be utilized for more detailed analysis, it was decided to include all the height measurements and the three length of arm measurements—all of which except height of ankle show high correlations among themselves and comparatively low correlations with the girths—and, in addition, three of the longest vertical measurements taken over the curves of the body. The three measurements chosen under the latter heading were vertical trunk girth (over shoulder and through crotch), length from cervicale around neck base to waist anterior, and total crotch length (from waist posterior through crotch to waist anterior). These three measurements, particularly the first and last, show higher correlations with the girth measurements previously considered than with the other vertical measurements considered here.

The correlations among the 17 vertical measurements selected are shown in table 13 for the full sample of 10,000 women. The correlations are, on the whole, quite large—about the size of the correlations among the girths. The correlations with ankle height, trunk girth, crotch length, and cervicale to waist, however, are much smaller than the rest, and two of the correlations with crotch length are actually negative. Next to these four measurements, the correlations with sitting height are the smallest.

In interpreting these coefficients, it must be borne in mind that many of the measurements overlap. Thus height of cervicale accounts for six-sevenths of stature, so that a correlation between them of 0.95 is not surprising.

In order to eliminate this spurious correlation between overlapping measurements, five body segments obtained by taking differences between overlapping measurements were selected, and the correlations of each with the 17 vertical measurements were computed. The results are shown in table 14. It is apparent that thigh length, as measured by hip height minus tibiale height, and lower arm length, as measured by total arm length minus upper arm length, show larger correlations with most of the other measurements than does head and neck (stature minus cervicale height) or either of the trunk segments.

While the figures in table 14 eliminate in large part the spurious correlations between overlapping measurements, they have a weakness of their own. Since they are differences between pairs of measurements, they have larger sampling errors than either measurement taken separately. This tends to reduce the correlations with most measurements because errors of measurement ordinarily show only small correlations with other measurements.

The coefficients relating the difference between measurements to the two measurements from which the difference is computed are especially affected by errors of measurement. The measurement forming the minuend of the difference is likely to show a higher correlation than would be the case if errors of measurement could be eliminated, since these errors are obviously positively correlated. This, in part, is the reason for a correlation of 0.81 between hip height and hip height minus tibiale height. In the same way the measurement forming the subtrahend of the difference shows a lower correlation than is actually the case, due to the negative correlation of errors of measurement. This is almost certainly the reason for the negative correlation between hip height and waist height minus hip height.

Table 13.—*Correlations among 17 vertical measurements of 10,042 women*

Measurement	Cervicale height	Bust height	Waist height	Abdominal-extension height	Hip height	Sitting-spread height	Crotch height	Tibiale height	Ankle height	Total posterior arm length	Upper posterior arm length	Anterior arm length	Sitting height	Vertical trunk girth	Total crotch length	Cervicale to waist anterior
Stature	[1].9512	[1].8894	[1].9098	[1].8328	[1].8346	[1].8119	[1].8469	[1].7269	[1].3481	.7310	.6505	.6572	.6499	.3255	.1800	.3619
Cervicale height		[1].8784	[1].9221	[1].8424	[1].8398	[1].8163	[1].8470	[1].7542	[1].3422	.7547	.6782	.6553	[1].6789	.3887	.2427	.3597
Bust height			[1].8676	[1].8286	[1].8238	[1].8011	[1].8517	[1].7129	[1].3339	.6713	.6004	.6536	.5531	.1364	.0164	.2338
Waist height				[1].8643	[1].8673	[1].8491	[1].8741	[1].7536	[1].3278	.7567	.6662	.6644	.5522	.3017	.2717	.1863
Abdominal-extension height					[1].8263	[1].8122	[1].8454	[1].7113	[1].3140	.6989	.6151	.6536	.4504	.1386	.0587	.1642
Hip height						[1].8501	[1].8616	[1].7164	[1].3130	.7224	.6387	.6640	.4449	.1401	.0550	.1587
Sitting-spread height							[1].8451	[1].7022	[1].3018	.7021	.6134	.6509	.4143	.1353	.0546	.1599
Crotch height								[1].7985	[1].2990	.7134	.6279	.6844	.4127	.0562	−.0365	.1576
Tibiale height									[1].2847	.6115	.5349	.5602	.3935	.1496	.0631	.1975
Ankle height										.2524	.2418	.2225	.2518	.0992	.0471	.1133
Total posterior arm length											[1].8822	.7257	.4174	.3010	.2051	.2715
Upper posterior arm length												.6406	.3854	.2776	.1856	.2538
Anterior arm length													.3231	.0528	−.0223	.1439
Sitting height														.4895	.3494	.4071
Vertical trunk girth															.8251	.5996
Total crotch length																.2805

[1] Overlapping measurements.

Table 14.—*Correlations of 5 body segments with 17 vertical measurements of 10,042 women*

Measurement	Difference between measurements				
	Hip height minus tibiale height	Waist height minus hip height	Cervicale height minus waist height	Stature minus cervicale height	Total posterior arm length minus upper posterior arm length
Stature	.5630	.2966	.4531	[1] .3821	.5850
Cervicale height	.5471	.3117	[1] .5507	.0782	.5960
Bust height	.5595	.2320	.3593	.2426	.5335
Waist height	.5864	[1] .4175	.1847	.1779	.6146
Abdominal-extension height	.5644	.2209	.2750	.1677	.5679
Hip height	[1] .8057	−.0903	.2620	.1814	.5834
Sitting-spread height	.6058	.1468	.2416	.1785	.5762
Crotch height	.5403	.1759	.2656	.1995	.5796
Tibiale height	.1639	.2000	.2899	.0895	.5010
Ankle height	.2008	.0846	.1620	.0995	.1807
Total posterior arm length	.5023	.1951	.2846	.1012	[1] .8100
Upper posterior arm length	.4490	.1668	.2853	.0707	.4384
Anterior arm length	.4633	.1170	.2310	.1609	.5873
Sitting height	.2950	.2925	.5331	.0663	.3166
Vertical trunk girth	.0711	.3479	.3364	−.1126	.2287
Total crotch length	.0242	.4432	.0301	−.1449	.1602
Cervicale to waist anterior	.0567	.0830	.5117	.0918	.2021

[1] Overlapping measurements.

If the correlations among the vertical measurements require more qualification than those among the girths on account of their spuriousness, they require less on account of lack of linearity of regression. A large number of broken-line regressions were examined for a sample of 2,000 women, and the closeness of the approach to linearity was indeed excellent. The only exceptions to this generalization are the graphs involving trunk girth, crotch length, and cervicale to waist. The regressions of these three measurements on each other appear to be linear, but the regressions of other vertical measurements on them show a consistent concavity downward. Some of the lines even appear to reach maxima and to decline.

For the full sample of 10,000 women, graphs of the averages of 5 measurements for 1-inch intervals of stature are shown in figure 13. The approximations to linearity are seen to be very good. Another point also is brought out by this chart, and more exactly by table 50 on which it is based. By comparing the measurements of women less than 56 inches tall with those more than 70 inches, it can be seen how much of the 15-inch increase in stature goes to each segment of the body. It is immediately clear that the segments do not share proportionately in the increase. The length of the lower leg, as measured by height of tibiale, accounts for a little over one-fourth of total height on the average woman but receives a little over 5 inches, or one-third of the 15-inch increase in stature. Height of hip increases nearly 10 inches, so that by subtraction, the upper leg may be said to take over 4½ inches of the increase. Trunk length, as measured by cervicale height minus hip height, takes somewhat over 4 inches and, as measured by sitting height, slightly less than 5 inches. Stature minus cervicale height takes less than 2 inches of the increase. It is clear that the legs share more than proportionately and the trunk less than proportionately in increases in stature.

The first and second principal components were computed for the 17 vertical measurements, and the results reported in table 15. No single measurement holds the commanding position among the vertical measurements that weight holds among the girths. Cervicale height shows a correlation of 0.96 compared with 0.95 for waist height and stature. Vertical trunk girth, crotch length, and cervicale to waist have very low correlations, and partly for this reason the first component accounts for only 59 percent of the variation compared with 71 percent for the girths. The second principal component

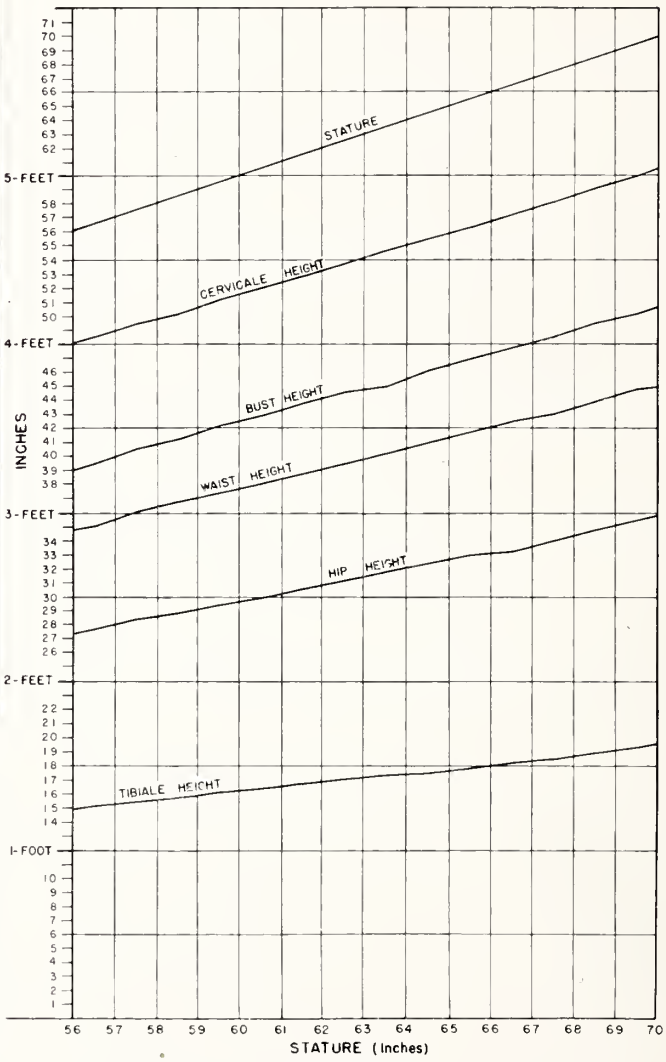

FIGURE 13.—Average height measurements of women, by stature.

shows high correlations with these same three measurements, particularly vertical trunk girth, and seems to be primarily a fleshy component, in contrast to the first component which is largely skeletal.

Table 15.—*First and second principal components of 17 vertical measurements of 10,042 women*

Measurement	Correlation with— First principal component	Correlation with— Second principal component
Stature	.9482	.0511
Cervicale height	.9610	.1026
Bust height	.9050	−.1440
Waist height	.9497	−.0043
Abdominal-extension height	.8913	−.1698
Hip height	.9004	−.1787
Sitting-spread height	.8810	−.1824
Crotch height	.9063	−.2643
Tibiale height	.8017	−.1318
Ankle height	.3773	.0014
Total posterior arm length	.8409	.0338
Upper posterior arm length	.7628	.0489
Anterior arm length	.7493	−.2160
Sitting height	.6099	.4320
Vertical trunk girth	.3139	.9051
Total crotch length	.1914	.8247
Cervicale to waist anterior	.3193	.6107
Proportion of variation accounted for by each component	*.5877*	*.1367*

The overlapping nature of the height measurements is reflected, of course, in the principal components. The three heights which are approximately equal to leg length (height of hip, crotch, and sitting spread) have correlations with the first component of approximately 0.90 partly because they are of necessity so highly correlated with each other. In spite of this limitation, however, the principal components do give a valuable perspective on the nature of the interrelations of the vertical measurements.

That hip height, crotch height, and sitting-spread height are rather highly correlated even for women of the same stature is shown in table 16. Of the entire set of partial correlations holding stature constant, the highest (except for the correlations of vertical trunk girth with crotch length and cervicale to waist) are the three correlations among these three measurements. It is also seen that the majority of correlations between sitting height, vertical trunk girth, crotch length, and cervicale to waist on the one hand and the remaining 12 measurements on the other are negative. With 2 negligible exceptions in the first group, the correlations between pairs of measurements within each of these 2 groups are positive. Thus it may be said that among women of the same height, those with long legs have long arms and short trunks. The contrast is one between limbs and trunk.

These results would not be greatly different if, instead of considering all women, only those with a given weight or a given bust measurement were considered. This was proved by computing two sets of first order and two sets of second order correlations among the vertical measurements. The two sets of first order correlations were those with weight constant and those with girth of bust constant. No large differences between these correlations and the corresponding simple correlations were found except for the three measurements, vertical trunk girth, crotch length, and cervicale to waist. Most of the correlations involving these three measurements were considerably smaller when weight was held constant and somewhat smaller with bust constant.

The two sets of second order correlations were computed from the first order correlations by holding stature constant. Again the only important differences were the correlations involving vertical trunk girth, crotch length, and cervicale to waist. It was concluded, therefore, that the only significant changes that would have to be made in the conclusions drawn above are those involving these three measurements, chiefly the composition of the second principal component in table 15.

Table 16.—*Partial correlations among 16 vertical measurements of 10,042 women, with stature constant*

Measurement	Bust height	Waist height	Abdominal-extension height	Hip height	Sitting-spread height	Crotch height	Tibiale height	Ankle height	Total posterior arm length	Upper posterior arm length	Anterior arm length	Sitting height	Vertical trunk girth	Total crotch length	Cervicale to waist anterior
Cervicale height	[1].2301	[1].4426	[1].2942	[1].2701	[1].2442	[1].2525	[1].2965	[1].0686	.2824	.2534	.1295	[1].2592	.2712	.2351	.0540
Bust height		[1].3081	[1].3476	[1].3236	[1].2930	[1].4054	[1].2118	[1].0567	.0679	.0629	.2005	−.0716	−.3540	−.3196	−.2065
Waist height			[1].4641	[1].4721	[1].4555	[1].4692	[1].3239	[1].0287	.3236	.2358	.2124	−.1238	.0143	.2644	−.3694
Abdominal-extension height				[1].4303	[1].4210	[1].4758	[1].2786	[1].0464	.2385	.1743	.2547	−.2156	−.2531	−.1675	−.2658
Hip height					[1].5363	[1].5283	[1].2900	[1].0435	.2989	.2290	.2782	−.2328	−.2526	−.1758	−.2791
Sitting-spread height						[1].5074	[1].2795	[1].0352	.2727	.1921	.2367	−.2555	−.2336	−.1595	−.2462
Crotch height							[1].5009	[1].0084	.2601	.1907	.3190	−.3406	−.4364	−.3613	−.3002
Tibiale height								[1].0493	.1711	.1190	.1593	−.1510	−.1339	−.1003	−.1023
Ankle height									−.0031	.0215	−.0088	.0359	−.0158	−.0169	−.0144
Total posterior arm length										.7846	.4769	−.1111	.0978	.1094	.0110
Upper posterior arm length											.3722	−.0646	.0918	.0917	.0260
Anterior arm length												−.1815	−.2261	−.1897	−.1336
Sitting height													.3869	.3108	.2427
Vertical trunk girth														.8241	.5466
Total crotch length															.2349

[1] Overlapping measurements.

Standard System of Body Measurements

As a Basis for Garment and Pattern Sizes

The preceding sections have been devoted to a general discussion of women's body measurements as determined in this study. With this as a background, consideration will now be given to the main question the present survey was designed to answer, namely, what is the best set of body measurements upon which clothing and pattern sizes for American women can be based.

The formulation of a standard system of garment and pattern sizes so designed that better-fitting clothes can be made for the Nation's women, involves three steps: (1) Construction of a standard set of forms or mannequins sized to represent the body measurements of women in the United States; (2) determination of necessary garment tolerances to allow for underclothing, comfort, and style, so as to translate the measurements of the mannequins into dimensions for finished garments; and (3) establishment of a standard measuring procedure and method of designating the standard sizes so that each woman can be identified with the mannequin resembling her.

The second and third steps will not be considered in this report since they can best be accomplished by agreement among consumers and the industries concerned. However, the present study provides data for constructing a standard system of mannequins.

Scientific Selection of a Sizing System

The chief problem in setting up a satisfactory set of body measurements for garment and pattern sizing is one of selecting the combination of measurements that is most closely related to the other dimensions of a woman's body. (See Theoretical Considerations in Sizing Garments and Patterns, Appendix A, p. 55.) No single measurement is adequate as a basis for sizing because no measurement is closely related both to the heights and to the girths. In particular, bust girth, which is the usual determinant of dress sizes at present, shows only a feeble relation to the various height measurements (table 3 in pocket on back cover). That is, women with bust measure 32 inches are almost exactly as tall, on the average, as those with bust 44 (table 48).

Two measurements are needed, one as an index of the vertical measurements and the other as an index of the horizontal measurements. Women vary much more in their girths than in their heights, and in addition, for many types of garments, the fit in the circumference measures is far more important than in the length measures. For this reason only a few vertical sizes will be required. Perhaps "regulars," "longs," and "shorts" are all that are necessary. Such decisions, however, must be made with primary regard to consumer preferences and commercial feasibility rather than on the basis of the data collected in this survey.

The preceding analysis demonstrated that stature (that is, total height), height of cervicale, and height of waist, are most closely related to the majority of the vertical measurements. From among these three, practical considerations immediately dictate the choice of stature as the index of the vertical measurements. Most women know their statures, approximately at least, while few know how high their waists or their cervicales are above the floor. Also stature is more easily measured on the fully clothed woman than either of the other two heights. Thus stature seems the only reasonable choice as a vertical control measurement.

For the horizontal measurements, the solution is not quite so obvious. Weight is most closely related to the girth measurements (p. 36). Practical objections to the use of weight, however, may be raised. Retail stores and homes frequently do not have scales, and it is conceivable that women would object to telling their weights more than to giving, say, their bust measures. Whether or not these practical considerations outweigh the manifest scientific advantage of weight is beyond the scope of this bulletin. It seems desirable, therefore, to present the necessary figures for several alternative sizing schemes.

Stature-weight system.—Table 17, provides in compact form the figures required to set up a system based on stature and weight. The three columns of figures are sufficient for the calculation of the measurements corresponding to any given height and weight.

Table 17.—*System of women's body measurements based on stature and weight*

Item number and measurement	Value corresponding to stature 64 inches and weight 135 pounds	Increase (or decrease)[1] in value for each— 4-inch increase (or decrease) in stature	10-pound increase (or decrease) in weight
	Pounds	*Pounds*	*Pounds*
1. Weight	135.00	0.00	10.00
Vertical measurements:	*Inches*	*Inches*	*Inches*
2. Stature	64.00	4.00	0.00
3. Cervicale height	55.06	3.46	.07
4. Bust height	45.75	3.44	−.45
5. Waist height	40.65	2.83	.04
6. Abdominal-extension height	36.82	2.66	−.07
7. Hip height	32.11	2.44	−.05
8. Sitting-spread height	29.52	2.38	−.05
9. Crotch height	29.04	2.47	−.10
10. Tibiale height	17.48	1.27	−.02
11. Ankle height	3.02	.16	0
12. Total posterior arm length	23.29	1.32	.07
13. Upper posterior arm length	13.44	.77	.04
14. Anterior arm length	16.86	1.23	−.04
15. Sitting height	24.86	1.18	.09
16. Vertical trunk girth	60.41	.78	1.09
17. Cervicale to waist anterior	19.23	.46	.21
18. Anterior waist length	12.99	.38	.11
19. Shoulder to waist	15.71	.42	.17
20. Neck to bust	11.04	−.25	.38
21. Posterior waist length	15.10	.55	.10
22. Scye depth	7.81	.09	.14
23. Trunk line	7.73	.49	−.07
24. Arm length, shoulder to scye	5.52	.12	.09
25. Waist to hip	9.12	.35	.11
26. Total crotch length	29.78	.03	.78
27. Anterior crotch length	14.59	.02	.42
Horizontal measurements:			
28. Chest girth at armscye	34.79	−.74	1.13
29. Bust girth	35.58	−1.22	1.40
30. Waist girth	28.99	−1.92	1.60
31. Abdominal-extension girth	36.14	−1.54	1.71
32. Hip girth	38.91	−.46	1.20
33. Sitting-spread girth	38.69	−.68	1.39
34. Maximum thigh girth	22.30	−.31	.77
35. Midway thigh girth	19.61	−.28	.65
36. Bent knee girth	14.38	.11	.41
37. Knee girth at tibiale	14.02	.01	.37
38. Calf girth	13.50	0	.36
39. Minimum leg girth	8.33	.02	.16
40. Ankle girth	9.36	.15	.14
41. Neck-base girth	15.32	.04	.24
42. Armscye girth	16.12	−.23	.50
43. Upper-arm girth	11.34	−.56	.54
44. Elbow girth	10.38	−.01	.26
45. Forearm girth	9.77	−.07	.27
46. Wrist girth	6.04	.04	.10
47. Shoulder length	4.67	.13	.04
48. Anterior chest width	12.53	.14	.20
49. Highest bust-level width	7.38	0	.16
50. Posterior chest width	13.41	−.12	.31
51. Anterior bust arc	20.05	−.81	.90
52. Anterior waist arc	16.41	−1.27	.98
53. Abdominal-extension arc	19.63	−.83	.92
54 Posterior hip arc	19.19	−.31	.60
Angle:	*Degrees*	*Degrees*	*Degrees*
59. Shoulder slope	23.17	.48	−.10

[1] Multiple regression coefficients computed by method of least squares from the measurements of 10,042 women. See tables 2, 10, and 51 for basic statistics and Appendix A for rationale of regression method.

For a woman 5 feet 4 inches tall and weighing 135 pounds,[11] column 2 gives the average dimensions. Column 3 shows how much, on the average, each measurement must be increased to give the dimensions of a woman 4 inches taller (that is 5 feet 8) but with the same weight. Such a woman is, of course, slimmer than the woman represented in column 2. Her bust girth, for example, is 1.22 inches less than that of the woman 5 feet 4 with the same weight. Her vertical measurements are greater, with only one minor exception. The sums of columns 2 and 3, therefore, with regard to sign, are the average measurements of women 5 feet 8 inches tall and weighing 135 pounds.

Column 4 shows how much, on the average, each measurement must be increased to give the dimensions of a woman 10 pounds heavier (that is, 145 pounds) but with the same height (5 feet 4 inches) as for column 2. Bust increases 1.40 inches and hips 1.20 inches. The sums of columns 2 and 4, therefore, with regard to sign, are the average measurements of women 5 feet 4 inches tall and weighing 145 pounds.

Measurements corresponding to any given height and weight may be calculated by combining all three columns. Thus suppose the measurements corresponding to height 5 feet and weight 160 pounds are desired. Starting with the values in column 2, the first step is to subtract those in column 3. The results are the measurements of a woman 5 feet tall and weighing 135 pounds. To take an example, for bust girth the figures are 35.58 minus (−1.22) which is 35.58 plus 1.22 or 36.80 inches. Since 160 pounds is 25 pounds greater than the base figure of 135 pounds, the second step is to add to the results just obtained 2½ times the values in column 4. For bust girth this gives 36.80 plus 2½ times 1.40 which is 36.80 plus 3.50 or 40.30 inches. The same simple procedure gives the value of the other 52 measurements for a woman 5 feet tall weighing 160 pounds.

Stature-girth systems.—If practical considerations make it impossible to use weight as a control measurement, alternative schemes may be considered. The measurements most closely related to all the girths are, besides weight, the six horizontal trunk girths together with maximum thigh girth and upper-arm girth (table 5).

The last two are eliminated quickly by practical considerations. Both measurements, especially upper-arm girth, vary so little among women that errors of measurement would cause much difficulty (table 2). In addition maximum thigh girth would be inconvenient to take on a fully clothed woman. Of the six body girths, girth of chest at armscye and girth of bust are highly correlated with each other and show almost the same correlations with the remaining girths. There is little to choose between them on theoretical grounds, therefore, and since bust measure is in common use, chest girth may be eliminated. Much the same situation obtains with hip and sitting-spread girth, with the additional consideration that sitting-spread girth cannot be taken accurately on the fully clothed woman. Girth of sitting spread also was eliminated, therefore. This left four trunk girths, i. e., bust, waist, abdominal

[11] A stature of 64 inches was chosen because it is the next higher inch above the mean and a weight of 135 pounds because it is the next higher 5 pounds above the mean (table 2).

extension, and hips, as alternatives to weight in garment sizing.

Table 18 shows how accurately each of these 4 measurements in conjunction with stature predicts the remaining 53 measurements and how the accuracy of these combinations compares with the stature-weight combination. The heights and arm lengths are about equally well predicted by each set, since they depend almost entirely on stature, which is included in all 5 sizing schemes. For the 6 body girths, stature and weight is the only set for which every correlation is greater than 0.90. Each of the other sets has at least 3 correlations below that figure. For all the remaining girths except 2, the stature-weight combination is the best predictor of all 5 sets. For the other measurements, most of which are rather unimportant, stature and weight are not any better than the other combinations except perhaps stature and hip girth. On the whole, the superiority of stature and weight is clear.

Table 18.—*Multiple correlations of 54 measurements with stature and each of 5 other measurements for 10,042 women*

Measurement	Multiple correlation with—				
	Stature and weight	Stature and bust girth	Stature and waist girth	Stature and abdominal-extension girth	Stature and hip girth
Weight	----------	.9221	.9189	.9242	.9255
Stature	----------	----------	----------	----------	----------
Cervicale height	.9547	.9537	.9546	.9546	.9538
Bust height	.9045	.9044	.9071	.9078	.9024
Waist height	.9112	.9110	.9109	.9119	.9112
Abdominal - extension height	.8374	.8360	.8367	.8439	.8374
Hip height	.8379	.8373	.8360	.8367	.8383
Sitting-spread height	.8152	.8136	.8135	.8138	.8144
Crotch height	.8596	.8552	.8562	.8573	.8620
Tibiale height	.7278	.7272	.7271	.7273	.7282
Ankle height	.3486	.3490	.3502	.3513	.3488
Total posterior arm length	.7464	.7454	.7465	.7458	.7432
Upper posterior arm length	.6636	.6623	.6643	.6636	.6607
Anterior arm length	.6647	.6646	.6651	.6654	.6636
Sitting height	.6751	.6671	.6655	.6697	.6756
Vertical trunk girth	.8965	.8584	.8710	.8678	.8451
Cervicale to waist anterior	.6000	.6095	.5845	.5483	.5436
Anterior waist length	.4656	.4685	.4618	.4312	.4285
Shoulder to waist	.5483	.5682	.5116	.4996	.5017
Neck to bust	.6407	.6580	.6421	.6446	.5735
Posterior waist length	.5091	.4955	.5257	.5024	.4996
Scye depth	.4616	.4418	.4919	.4975	.4286
Trunk line	.3457	.3505	.3506	.3697	.3428
Arm length, shoulder to scye	.3948	.4233	.4194	.4336	.3905
Waist to hip	.4141	.3924	.3830	.4143	.4327
Total crotch length	.8191	.7562	.7655	.8128	.8025
Anterior crotch length	.7184	.6829	.6893	.7211	.6826
Chest girth at armscye	.9024	.9410	.8964	.8618	.8032
Bust girth	.9183	----------	.9202	.8845	.8139
Waist girth	.9154	.9206	----------	.9329	.8266
Abdominal - extension girth	.9205	.8845	.9326	----------	.8781
Hip girth	.9229	.8165	.8281	.8797	----------
Sitting-spread girth	.9046	.8006	.8172	.8734	.9373
Maximum thigh girth	.8765	.7531	.7339	.7912	.9077
Midway thigh girth	.8217	.6979	.6669	.7184	.8292
Bent-knee girth	.7759	.6714	.6735	.6918	.7573
Knee girth at tibiale	.7694	.6534	.6618	.6851	.7542
Maximum calf girth	.7760	.6528	.6298	.6420	.7415
Minimum leg girth	.6269	.5097	.5178	.5195	.6010
Ankle girth	.5784	.5147	.5300	.5164	.5455
Neck-base girth	.6749	.6676	.6674	.6217	.5857
Armscye girth	.8286	.8172	.8181	.8083	.7547
Upper-arm girth	.9055	.8719	.8545	.8550	.8405
Elbow girth	.7572	.7078	.6962	.6836	.6972
Forearm girth	.8342	.7752	.7456	.7391	.7654
Wrist girth	.6717	.6274	.6510	.6292	.6098
Shoulder length	.3055	.2964	.3010	.2916	.2859
Anterior chest width	.6041	.6123	.5796	.5550	.5370
Highest bust-level width	.5101	.5322	.5128	.4942	.4463
Posterior chest width	.6571	.6812	.6599	.6125	.5788
Anterior bust arc	.8508	.9217	.8411	.8210	.7511
Anterior waist arc	.8732	.8813	.9480	.8960	.7790
Abdominal-extension arc	.8702	.8483	.8995	.9318	.8077
Posterior hip arc	.7934	.6849	.6926	.7385	.8634
Shoulder slope	.0865	.1046	.0918	.0876	.0808

Among the alternatives to stature and weight, there is not a great deal to choose. Stature and hip girth is clearly best for the lower trunk and leg girths, but it is perhaps the poorest indicator of the upper trunk, neck, and arm girths. Stature-bust and stature-waist are best for the latter measurements but poor for the lower body girths. Stature and abdominal extension is more or less intermediate.

On the basis of these results, it was decided to provide the figures necessary to set up a sizing system based on any one of the alternatives. These figures are shown in table 19. They are in exactly the same form as those in table 17 and may be used in the same way.

There is a disadvantage which may be serious in sizing by any of these four measurements, namely, what may be called a lack of balance. The measurement used as a basis for sizing increases too rapidly in relation to the increases in other measurements. In sizing on bust girth and stature, for example, each 2-inch increase in bust girth calls for increases of 2.11 inches in waist girth, 2.15 inches in abdominal extension, and 1.39 inches in hips. In sizing on hip girth and stature, increases of 1.90 inches in bust, 2.21 inches in waist, and 2.49 inches in abdominal extension are called for by a 2-inch increase in hip girth. These increases are not nearly in proportion. Bust measure increases too rapidly in relation to the other measures in the former case and hip measure too rapidly in the latter case. The sizing scheme based on weight and stature avoids this overemphasis on any one measure (except weight itself, which does not determine any garment measure) and provides well-balanced increases in each measurement.

If, in spite of these advantages, it becomes necessary for purely practical reasons to use one of the girths instead of weight as a basis for sizing, it may be advisable to introduce a third dimension into the sizing system. This may be done by including, in addition to "regulars," "longs," and "shorts," a set of "stouts" and conceivably also a set of "slims"—a practice which is followed at the present time by many manufacturers of men's suits. If bust girth and stature are the basis of the sizing scheme, each stout size would have a larger abdominal extension and hip girth than the corresponding regular, although its bust measure and its length would be the same as for the regular.

The modifications in measurements that would be required in this case are shown in table 20. They

Table 19.—*Four alternative systems of women's body measurements based on stature and each of four girth measurements*

Item number and measurement	System based on stature and bust girth			System based on stature and waist girth			System based on stature and abdominal-extension girth			System based on stature and hip girth		
	Value corresponding to stature 64 inches and bust girth 36 inches	Increase (or decrease)[1] in value for each— 4-inch increase (or decrease) in stature	Increase (or decrease)[1] in value for each— 2-inch increase (or decrease) in bust girth	Value corresponding to stature 64 inches and waist girth 30 inches	Increase (or decrease)[1] in value for each— 4-inch increase (or decrease) in stature	Increase (or decrease)[1] in value for each— 2-inch increase (or decrease) in waist girth	Value corresponding to stature 64 inches and abdominal-extension 37 inches	Increase (or decrease)[1] in value for each— 4-inch increase (or decrease) in stature	Increase (or decrease)[1] in value for each— 2-inch increase (or decrease) in abdominal-extension	Value corresponding to stature 64 inches and hip girth 39 inches	Increase (or decrease)[1] in value for each— 4-inch increase (or decrease) in stature	Increase (or decrease)[1] in value for each— 2-inch increase (or decrease) in hip girth
	Pounds	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*
1. Weight	137.56	8.74	12.05	140.34	11.50	10.48	139.30	8.97	9.93	135.69	4.59	14.12
Vertical measurements:	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*
2. Stature	64.00	4.00	.00	64.00	4.00	.00	64.00	4.00	.00	64.00	4.00	.00
3. Cervicale height	55.08	3.53	.08	55.10	3.55	.08	55.10	3.53	.08	55.07	3.50	.10
4. Bust height	45.71	3.31	−.20	45.66	3.26	−.19	45.67	3.30	−.18	45.74	3.37	−.21
5. Waist height	40.66	2.86	.05	40.67	2.87	.04	40.67	2.87	.05	40.65	2.85	.06
6. Abdominal-extension height	36.81	2.61	−.07	36.79	2.59	−.07	36.77	2.60	−.11	36.82	2.64	−.10
7. Hip height	32.10	2.40	−.06	32.10	2.39	−.04	32.10	2.40	−.04	32.11	2.42	−.08
8. Sitting-spread height	29.51	2.34	−.05	29.50	2.33	−.04	29.50	2.34	−.04	29.52	2.36	−.07
9. Crotch height	29.01	2.38	−.11	28.98	2.36	−.10	28.99	2.38	−.10	29.03	2.43	−.17
10. Tibiale height	17.48	1.25	−.01	17.47	1.25	−.01	17.47	1.25	−.01	17.48	1.26	−.03
11. Ankle height	3.01	.16	.00	3.01	.16	.00	3.01	.16	−.01	3.02	.16	.00
12. Total posterior arm length	23.31	1.38	.09	23.33	1.40	.08	23.32	1.38	.07	23.29	1.35	.09
13. Upper posterior arm length	13.45	.80	.05	13.47	.81	.05	13.46	.80	.04	13.44	.79	.05
14. Anterior arm length	16.85	1.20	−.06	16.83	1.18	−.05	16.84	1.19	−.05	16.86	1.21	−.06
15. Sitting height	24.88	1.25	.09	24.90	1.27	.08	24.90	1.25	.08	24.87	1.21	.13
16. Vertical trunk girth	60.69	1.73	1.36	61.02	2.05	1.21	60.90	1.76	1.13	60.48	1.27	1.56
17. Cervicale to waist anterior	19.29	.64	.28	19.34	.70	.23	19.31	.64	.19	19.24	.56	.27
18. Anterior waist length	13.02	.48	.15	13.05	.51	.13	13.03	.48	.10	12.99	.44	.14
19. Shoulder to waist	15.76	.57	.24	15.80	.62	.18	15.78	.57	.16	15.73	.50	.23
20. Neck to bust	11.15	.08	.51	11.26	.20	.43	11.22	.09	.41	11.07	−.07	.52
21. Posterior waist length	15.12	.64	.12	15.16	.68	.13	15.14	.64	.10	15.10	.60	.14
22. Scye depth	7.84	.22	.18	7.90	.26	.18	7.88	.22	.17	7.82	.16	.20
23. Trunk line	7.71	.43	−.09	7.69	.41	−.08	7.69	.43	−.09	7.72	.46	−.10
24. Arm length, shoulder to scye	5.55	.20	.13	5.58	.23	.11	5.57	.21	.11	5.52	.16	.14
25. Waist to hip	9.14	.45	.12	9.17	.47	.10	9.17	.45	.12	9.13	.39	.18
26. Total crotch length	29.98	.71	.94	30.21	.93	.83	30.14	.73	.83	29.84	.37	1.17
27. Anterior crotch length	14.70	.39	.53	14.82	.51	.46	14.78	.40	.46	14.62	.20	.61
Horizontal measurements:												
28. Chest girth at armscye	35.11	.25	1.55	35.44	.59	1.29	35.29	.28	1.17	34.86	−.20	1.55
29. Bust girth	36.00	.00	2.00	36.40	.42	1.61	36.21	.04	1.45	35.68	−.56	1.90
30. Waist girth	29.43	−.53	2.11	30.00	.00	2.00	29.75	−.49	1.76	29.10	−1.17	2.21
31. Abdominal-extension girth	36.61	.00	2.15	37.15	.48	1.98	37.00	.00	2.00	36.26	−.78	2.49
32. Hip girth	39.21	.59	1.39	39.54	.92	1.24	39.45	.62	1.24	39.00	.00	2.00
33. Sitting-spread girth	39.04	.53	1.61	39.42	.91	1.43	39.32	.56	1.44	38.79	−.12	2.20
34. Maximum thigh girth	22.48	.37	.87	22.68	.56	.74	22.62	.38	.75	22.35	.00	1.22
35. Midway thigh girth	19.76	.29	.72	19.92	.45	.60	19.87	.31	.61	19.66	.00	1.01
36. Bent knee girth	14.48	.47	.45	14.58	.57	.40	14.55	.48	.39	14.41	.29	.60
37. Knee girth at tibiale	14.11	.34	.41	14.21	.43	.37	14.17	.34	.36	14.05	.17	.56
38. Maximum calf girth	13.59	.32	.39	13.67	.40	.33	13.64	.32	.32	13.53	.16	.52
39. Minimum leg girth	8.37	.17	.17	8.41	.21	.15	8.40	.17	.14	8.34	.10	.24
40. Ankle girth	9.39	.27	.16	9.43	.31	.14	9.41	.27	.13	9.37	.21	.20
41. Neck-base girth	15.38	.24	.31	15.45	.32	.27	15.42	.25	.24	15.33	.15	.31
42. Armscye girth	16.26	.20	.65	16.41	.35	.57	16.35	.22	.53	16.16	.00	.70
43. Upper-arm girth	11.48	−.10	.68	11.63	.06	.58	11.57	−.08	.55	11.37	−.32	.76
44. Elbow girth	10.45	.21	.31	10.52	.28	.27	10.49	.22	.25	10.40	.11	.36
45. Forearm girth	9.84	.17	.33	9.92	.24	.28	9.89	.17	.26	9.79	.05	.38
46. Wrist girth	6.06	.13	.12	6.09	.16	.11	6.08	.13	.10	6.04	.09	.13
47. Shoulder length	4.68	.16	.05	4.69	.18	.05	4.69	.17	.04	4.67	.15	.06
48. Anterior chest width	12.59	.31	.27	12.64	.37	.22	12.61	.32	.19	12.54	.23	.27
49. Highest bust-level width	7.43	.14	.22	7.48	.19	.18	7.46	.14	.17	7.40	.08	.21
50. Posterior chest width	13.50	.16	.43	13.59	.25	.36	13.55	.17	.32	13.43	.03	.42
51. Anterior bust arc	20.31	−.03	1.27	20.56	.24	1.01	20.45	−.01	.93	20.11	−.38	1.21
52. Anterior waist arc	16.68	−.41	1.30	17.03	−.09	1.22	16.88	−.39	1.09	16.47	−.80	1.34
53. Abdominal-extension arc	19.88	−.02	1.18	20.19	.27	1.09	20.09	.00	1.07	19.70	−.41	1.31
54. Posterior hip arc	19.34	.22	.68	19.50	.37	.60	19.46	.23	.60	19.24	−.08	1.00
Angle:	*Degrees*	*Degrees*	*Degrees*	*Degrees*	*Degrees*	*Degrees*	*Degrees*	*Degrees*	*Degrees*	*Degrees*	*Degrees*	*Degrees*
59. Shoulder slope	23.13	.39	−.19	23.10	.35	−.13	23.12	.39	−.11	23.16	.43	−.14

[1] Multiple regression coefficients computed by method of least squares from the measurements of 10,042 women. See tables 2, 10, and 51 for basic statistics and Appendix A for rationale of regression method.

refer only to the case in which stature and bust girth are used as the basis for sizing, and they give only the proportional increases and decreases to be used. The actual increases and decreases that would be best might be only three-quarters as great or might be half again as great but should be in proportion to the numbers in the table. It will be seen that the modifications in vertical measurements except vertical trunk girth and the two crotch lengths are all less than a quarter of an inch, some being positive and others negative, so that they probably can be neglected. The horizontal measurements, on the other hand—particularly the lower trunk girths—show considerable increases, as was planned.

If hip girth is used instead of bust girth, the same sort of table could be set up for obtaining "stouts." In this case the upper trunk girths would receive the largest increases. If stature and abdominal extension, or stature and waist girth is used, it is more difficult to prophesy the figures, and it is not certain that they would be usable.

Table 20.—*Proportional*[1] *increases (or decreases) in 55 measurements to be used in obtaining "stouts" (or "slims") from "regulars" when control measurements are stature and bust girth*

Item number and measurement	Increase (or decrease)[1]	Item number and measurement	Increase (or decrease)[1]
	Pounds	Horizontal measurements:	*Inches*
1. Weight	9.04	28. Chest girth at armscye	0.32
		29. Bust girth	.00
Vertical measurements:	*Inches*	30. Waist girth	1.03
2. Stature	0.00	31. Abdominal-extension girth	1.69
3. Cervicale height	.09	32. Hip girth	1.65
4. Bust height	−.13	33. Sitting-spread girth	1.86
5. Waist height	.03	34. Maximum thigh girth	1.12
6. Abdominal-extension height	−.17	35. Midway thigh girth	1.01
7. Hip height	−.05	36. Bent knee girth	.54
8. Sitting-spread height	−.11	37. Knee girth at tibiale	.53
9. Crotch height	−.18	38. Maximum calf girth	.46
10. Tibiale height	−.03	39. Minimum leg girth	.24
11. Ankle height	.00	40. Ankle girth	.16
12. Total posterior arm length	.03	41. Neck-base girth	.12
13. Upper posterior arm length	.02	42. Armscye girth	.36
14. Anterior arm length	−.05	43. Upper-arm girth	.50
15. Sitting height	.13	44. Elbow girth	.23
16. Vertical trunk girth	.91	45. Forearm girth	.25
17. Cervicale to waist anterior	.05	46. Wrist girth	.09
18. Anterior waist length	.03	47. Shoulder length	.03
19. Shoulder to waist	−.01	48. Anterior chest width	.06
20. Neck to bust	.15	49. Highest bust-level width	.04
21. Posterior waist length	.11	50. Posterior chest width	.07
22. Scye depth	.15	51. Anterior bust arc	.04
23. Trunk line	−.04	52. Anterior waist arc	.67
24. Arm length, shoulder to scye	.03	53. Abdominal-extension arc	.80
25. Waist to hip	.10	54. Posterior hip arc	.87
26. Total crotch length	.84	Angle:	*Degrees*
27. Anterior crotch length	.39	59. Shoulder slope	.21

[1] Actual increases or decreases to be used may be greater or less than the values shown in this table, but they should be in proportion to the numbers shown here.

Measurements of Women Classified by Six Criteria

This section reports the averages for each of 5 measurements—namely, weight, stature, bust girth, waist girth, and hip girth—for 10,042 women classified by (1) State in which the woman was measured, which in nearly all cases was the State of residence; (2) habitat, that is, whether the woman lived in a city of 2,500 persons or more, in which case she is classed as "urban," or whether she lived in a town of less than 2,500, or in the open country, in which case she is classed as "rural"; (3) nativity, that is, whether born in the United States or in a foreign country; (4) marital status and number of children borne; (5) present occupation, that is, whether on Work Projects Administration employment, other employment, at school, or—in all other cases—at home; and (6) family income, that is, the total income of the family of which the woman was a part. It would, of course, be important to know not only the averages but also the distributions of the measurements and the extent of their interrelations as measured by correlation coefficients. It was impossible, however, to make all these calculations within the time available.

The results reported must be described as somewhat tentative. Many of the averages are based on the measurements of only 100 to 200 women, and, some are based on still fewer cases. More important the sampling procedure must have differed considerably from State to State. In the District of Columbia, for example, since a large amount of the measuring was done through the Department of Agriculture, a large proportion of employed women was obtained. Again, the measuring in all States was done almost entirely in urban areas, so that the rural sample is both small and unrepresentative. However, the tables in this section are presented in the expectation that, in spite of these limitations, they will provide useful data in a field where almost no data of their kind exist at present.

Throughout this part of the analysis, the women were grouped by age. This was done because (1) women, when classified by the factors listed above, have very different age distributions in several cases and (2) variations in average measurements with age are great enough to obscure the variations with any of the factors considered here. Only four age classes are used in the tables, but average age is also shown as an additional safeguard. Table 21 gives, for each age group, the distribution of women by the other factors mentioned above.

Table 22 shows averages for five measurements of women, by State. For the most part the differences in measurements among the eight States are not large, but some of the results are consistent enough to deserve attention. The women measured in Pennsylvania and in New Jersey are distinctly the shortest, probably due, at least in part, to the presence of a large proportion of women of South- and East-European stock. The women measured in New Jersey are the heaviest and have the largest girths. Those measured in the District of Columbia have the smallest weight and, in general, the smallest girths. This may be due to the large proportion of employed women in the Washington sample, for, as will be pointed out later, employed women are smaller for their height than other women.

Table 21.—*Distribution of 10,042 women whose measurements were analyzed, by State, habitat, nativity, marital status and number of children borne, occupation, and family income, for 4 age groups*

State, habitat, nativity, marital status and number of children borne, occupation, and family income	Number of women aged—				Total
	18–29 years	30–44 years	45–59 years	60 years and over	
State:					
Arkansas	417	622	361	80	1,480
California	701	746	516	156	2,119
District of Columbia	490	543	184	25	1,242
Illinois	583	213	82	11	889
Maryland	261	172	76	13	522
New Jersey	655	728	605	131	2,119
North Carolina	216	224	115	33	588
Pennsylvania	499	351	190	43	1,083
Habitat:					
Rural	413	327	278	86	1,104
Urban	3,391	3,247	1,842	404	8,884
Unknown	18	25	9	2	54
Nativity:					
Native	3,704	3,336	1,899	413	9,352
Foreign born	116	256	226	79	677
Unknown	2	7	4	----------	13
Marital status and number of children borne:					
Never been married	2,363	671	327	73	3,434
Married, no children	735	650	375	110	1,870
1 child	446	765	362	81	1,654
2 children	176	786	355	80	1,397
3 children	68	366	255	51	740
4 children	12	199	140	37	388
5 children	10	77	117	21	225
6 children	1	33	64	14	112
7 children	1	22	36	4	63
8 children	----------	15	24	8	47
9 or more children	----------	13	70	13	96
Unknown	10	2	4	----------	16
Occupation:					
At home	446	954	548	207	2,155
W. P. A. employment	737	1,217	1,049	206	3,209
Other employment	1,643	1,383	515	75	3,616
At school	983	38	7	----------	1,028
Unknown	13	7	10	4	34
Family income:					
Under $1,000	1,778	1,814	1,315	325	5,232
$1,000–$1,999	1,070	923	364	76	2,433
$2,000–$2,999	481	458	262	42	1,243
$3,000 and over	365	332	148	34	879
Unknown	128	72	40	15	255

Table 22.—*Means of 5 measurements of 10,042 women, by State, for 4 age groups*

State	Mean age of women aged—				Mean weight of women aged—				Mean stature of women aged—			
	18–29	30–44	45–59	60 and over	18–29	30–44	45–59	60 and over	18–29	30–44	45–59	60 and over
	Years	*Years*	*Years*	*Years*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Inches*	*Inches*	*Inches*	*Inches*
Arkansas	22.74	37.16	51.30	64.34	124.79	132.89	143.97	137.56	64.38	63.63	62.92	62.22
California	23.79	37.28	51.51	65.99	124.31	134.03	147.55	142.63	63.90	63.53	63.27	62.10
District of Columbia	24.80	36.70	50.81	[1] 65.10	119.71	127.53	141.63	[1] 141.00	63.87	63.79	63.21	[1] 62.11
Illinois	23.45	36.45	50.76	[1] 63.05	123.06	136.85	145.50	[1] 138.64	63.79	63.30	63.28	[1] 62.20
Maryland	23.08	36.62	52.67	[1] 63.58	122.96	136.18	150.87	[1] 137.92	63.65	63.27	62.79	[1] 61,87
New Jersey	23.16	37.92	51.34	63.28	125.26	143.12	150.25	148.54	62.83	62.43	61.84	61.35
North Carolina	22.78	37.84	50.87	[1] 67.14	122.37	129.30	143.23	[1] 135.91	63.83	63.32	63.22	[1] 62.45
Pennsylvania	23.26	37.23	51.54	[1] 65.41	122.88	136.18	149.72	[1] 140.88	62.57	62.29	62.15	[1] 61.71

State	Mean bust girth of women aged—				Mean waist girth of women aged—				Mean hip girth of women aged—			
	18–29	30–44	45–59	60 and over	18–29	30–44	45–59	60 and over	18–29	30–44	45–59	60 and over
	Inches	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*
Arkansas	33.95	35.27	37.27	36.91	26.34	28.69	31.26	31.47	37.66	38.98	40.32	39.21
California	34.25	35.64	37.86	37.48	26.44	28.67	31.58	32.05	37.50	38.77	40.20	40.15
District of Columbia	33.57	34.72	37.01	[1] 37.14	26.31	28.34	31.34	[1] 32.41	37.33	38.41	40.02	[1] 39.93
Illinois	33.72	35.73	37.30	[1] 36.25	26.21	29.17	32.02	[1] 31.28	37.35	39.13	39.96	[1] 39.48
Maryland	33.84	35.71	38.42	[1] 36.55	26.45	29.59	33.82	[1] 32.52	37.51	39.11	40.55	[1] 39.00
New Jersey	34.15	37.02	38.51	38.38	27.28	31.41	33.62	34.11	37.84	40.05	40.83	40.79
North Carolina	34.02	35.41	37.58	[1] 36.43	26.65	29.40	32.21	[1] 32.10	37.76	38.80	40.15	[1] 39.62
Pennsylvania	34.21	36.20	38.40	[1] 37.24	27.13	30.30	33.31	[1] 33.44	37.37	39.26	40.44	[1] 39.65

[1] Average based on less than 50 cases.

Rural-urban differences are shown in table 23, and, unlike interstate differences, the figures here may be summarized in a single statement: The rural women measured were larger. This is true of all five measurements for each age group. The rural women were 2 to 4 pounds heavier, just a shade taller, and up to half an inch larger in the girth measurements. The size of these differences is small, but their consistency is impressive.

The native and foreign-born women measured also differ in their body measurements, as will be seen in table 24. The foreign-born were shorter but, except in the 18- to 29-year age group, had larger girths and were heavier. The reason for the exception may be in the changed composition of the foreign-born population brought about by the immigration laws of the 1920's. A rough check indicates, however, that it may be due merely to chance, so that the exception might disappear if a larger sample were taken.

Table 23.—*Means of 5 measurements of 10,042 women, by habitat, for 4 age groups*

Measurement and habitat	Mean for women aged—			
	18–29 years	30–44 years	45–59 years	60 years and over
Age:	*Years*	*Years*	*Years*	*Years*
Rural	22.53	37.56	51.78	64.84
Urban	23.59	37.22	51.28	64.86
Weight:	*Pounds*	*Pounds*	*Pounds*	*Pounds*
Rural	125.36	136.83	150.27	145.60
Urban	123.09	134.68	146.71	141.63
Stature:	*Inches*	*Inches*	*Inches*	*Inches*
Rural	63.68	63.42	62.97	61.97
Urban	63.54	63.19	62.64	61.89
Bust girth:				
Rural	34.12	36.00	38.19	37.90
Urban	33.97	35.74	37.86	37.35
Waist girth:				
Rural	26.84	29.70	32.62	32.82
Urban	26.59	29.44	32.33	32.57
Hip girth:				
Rural	37.82	39.34	40.78	40.45
Urban	37.49	39.07	40.34	39.92

Table 24.—*Means of 5 measurements of 10,042 women, by nativity, for 4 age groups*

Measurement and nativity	Mean for women aged—			
	18–29 years	30–44 years	45–59 years	60 years and over
Age:	*Years*	*Years*	*Years*	*Years*
Native	23.46	37.17	51.29	64.86
Foreign born	23.84	38.31	51.80	64.78
Weight:	*Pounds*	*Pounds*	*Pounds*	*Pounds*
Native	123.41	134.63	147.02	141.61
Foreign born	121.16	138.30	149.18	147.06
Stature:	*Inches*	*Inches*	*Inches*	*Inches*
Native	63.58	63.29	62.79	61.99
Foreign born	62.70	62.11	61.71	61.47
Bust girth:				
Native	33.99	35.69	37.82	37.18
Foreign born	33.92	36.83	38.71	38.94
Waist girth:				
Native	26.62	29.38	32.25	32.45
Foreign born	26.54	30.48	33.48	33.66
Hip girth:				
Native	37.54	39.08	40.41	39.93
Foreign born	37.26	39.39	40.45	40.54

The averages for the foreign-born in the 18- to 29-year age group are based on 116 women, as table 21 shows. The standard deviation of weight for all women is 25.98 pounds according to table 2, and it is undoubtedly somewhat less for foreign-born women in the 18- to 29-year age group. Thus, the standard error of the average weight of foreign-born women 18 to 29 years old is in the neighborhood of 2 pounds, or approximately the same as the difference between the averages for native and foreign-born. The

differences in the girths are well within their sampling errors, so that it is doubtful whether a generalized test, if the data were available to make it, would show significance for this age group. It seems clear, however, that if foreign-born women 18 to 29 are heavier and have larger girths than native women, the differences are less than the corresponding differences shown in the 30 to 44 age group.

The two remaining criteria available for classifying women—namely, occupation and income—are particularly important to the clothing industry because they are closely related to expenditures for clothing. It goes without saying that women from well-to-do families spend much more on clothing than do women from families with lower incomes.[12] And it has also

Table 25.—*Means of 5 measurements of 10,042 women, by occupation, for 4 age groups*

Measurement and occupation	Mean for women aged—			
	18–29 years	30–44 years	45–59 years	60 years and over
Age:	*Years*	*Years*	*Years*	*Years*
At home	25.26	37.44	51.31	67.09
W. P. A. employment	24.04	38.05	51.63	62.95
Other employment	24.45	36.50	50.80	63.90
At school	20.60	[1] 34.52	(2)	
Weight:	*Pounds*	*Pounds*	*Pounds*	*Pounds*
At home	125.22	134.79	149.55	143.14
W. P. A. employment	125.90	140.75	148.68	144.33
Other employment	121.22	129.84	142.20	136.25
At school	124.01	[1] 133.82	(2)	
Stature:	*Inches*	*Inches*	*Inches*	*Inches*
At home	63.19	63.35	63.08	62.19
W. P. A. employment	62.54	62.54	62.10	61.70
Other employment	63.76	63.66	63.40	61.77
At school	64.13	[1] 64.23	(2)	
Bust girth:				
At home	34.55	35.76	38.09	37.51
W. P. A. employment	34.52	36.76	38.31	37.88
Other employment	33.65	34.92	36.98	36.31
At school	33.88	[1] 35.23	(2)	
Waist girth:				
At home	27.51	29.35	32.24	32.55
W. P. A. employment	27.78	30.97	33.26	33.30
Other employment	26.18	28.26	30.82	31.15
At school	26.06	[1] 27.73	(2)	
Hip girth:				
At home	37.89	39.18	40.68	40.09
W. P. A. employment	37.95	39.84	40.61	40.20
Other employment	37.18	38.41	39.77	39.42
At school	37.61	[1] 38.26	(2)	

[1] Average based on less than 50 cases.
[2] Averages not shown for less than 10 cases.

been shown that employed women spend much more for clothing than those at home, even when the women belong to families with the same income.[13]

Of the four occupational groups shown in table 25, the women measured who had Work Projects Administration employment were the shortest, and those who were at school (that is, in most cases, college) were the tallest. Women at home and in nonrelief employment are the intermediate groups. The last-named group, however, is much the lightest in weight of the four groups and has, on the whole, the smallest girth measurements. The women measured who were employed by the Work Projects Administration and those who were at home were the heaviest and largest in circumference.

Table 26.—*Means of 5 measurements of 10,042 women, by family income, for 4 age groups*

Measurement and family income	Mean for women aged—			
	18–29 years	30–44 years	45–59 years	60 years and over
Age:	*Years*	*Years*	*Years*	*Years*
Under $1,000	23.59	37.62	51.65	64.33
$1,000–$1,999	23.99	36.45	50.91	66.58
$2,000–$2,999	23.23	37.02	50.75	[1] 64.33
$3,000 and over	22.39	37.79	50.73	[1] 65.59
Weight:	*Pounds*	*Pounds*	*Pounds*	*Pounds*
Under $1,000	124.20	138.15	147.77	143.54
$1,000–$1,999	121.96	131.57	146.76	143.20
$2,000–$2,999	123.72	131.10	145.52	[1] 145.17
$3,000 and over	123.69	131.12	143.31	[1] 137.79
Stature:	*Inches*	*Inches*	*Inches*	*Inches*
Under $1,000	63.16	62.71	62.25	61.83
$1,000–$1,999	63.66	63.67	63.34	61.64
$2,000–$2,999	64.17	63.75	63.42	[1] 62.81
$3,000 and over	64.33	63.84	63.55	[1] 62.27
Bust girth:				
Under $1,000	34.16	36.34	38.11	37.70
$1,000–$1,999	33.87	35.16	37.70	37.35
$2,000–$2,999	33.81	35.15	37.43	[1] 37.38
$3,000 and over	33.93	35.16	36.95	[1] 37.07
Waist girth:				
Under $1,000	27.00	30.33	32.91	32.98
$1,000–$1,999	26.37	28.55	31.74	32.50
$2,000–$2,999	26.33	28.47	31.25	[1] 32.21
$3,000 and over	26.15	28.57	30.74	[1] 31.57
Hip girth:				
Under $1,000	37.63	39.48	40.49	40.16
$1,000–$1,999	37.35	38.70	40.20	40.15
$2,000–$2,999	37.60	38.68	40.29	[1] 40.25
$3,000 and over	37.59	38.65	39.92	[1] 39.41

[1] Average based on less than 50 cases.

When the women measured are classified by the income of the family to which they belong, there is a steady increase in stature as the income scale increases (table 26). Women from families with incomes of $3,000 or more were about an inch taller than those with family incomes of less than $1,000. For weight and the girth measurements, there is some decline with increased income, but the trend is not entirely clear.

Turning next to the classification of women on the basis of marital status and number of children borne, for which the averages are shown in table 27, the results are again significant. Since many of the group contain comparatively few cases, the averages are rather irregular, but the general trends are clear. Single women are the slimmest and weigh the least of any group, while single women and those married women who have not borne children are the tallest of the groups. Women who have had the most

[12] National Resources Committee. Consumer incomes in the United States: their distribution in 1935–36. 104 pp., illus. Washington, D. C. 1938.

[13] Williams, Faith M., and Hanson, Alice C. Money disbursements of wage earners and clerical workers in five cities in the West North Central-Mountain region, 1934–36. U. S. Dept. Labor, Bur. Labor Statis. Bul. 641, 390 pp., illus. 1939.

children rank at the other extreme; they are the shortest and heaviest, with the largest girth measurements.

In interpreting many of these differences in measurements, there is a temptation to base the explanation on the rather heavy immigration from the South and East of Europe during the past half century. If this line of reasoning is correct, materially different results should be obtained from tabulation of women in the South alone, since immigration into the South has been very small. Special tabulations were therefore made on the Arkansas and North Carolina samples combined for the 5 factors discussed above, not including State. This sample was comparatively small—only 2,068 women—but in no case were the results essentially different from those presented above for 10,042 women. The conclusions drawn above are no less valid for women in the 2 southern States than for all 8 States. We may be confident, therefore, that the results obtained above are not due solely, or even primarily, to the effect of the more recent immigration.

Table 27.—*Means of 5 measurements of 10,042 women, by marital status and number of children borne, for 4 age groups*

Marital status and number of children borne	Mean age of women aged—				Mean weight of women aged—				Mean stature of women aged—			
	18–29	30–44	45–59	60 and over	18–29	30–44	45–59	60 and over	18–29	30–44	45–59	60 and over
	Years	*Years*	*Years*	*Years*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Inches*	*Inches*	*Inches*	*Inches*
Never been married	22.12	35.77	51.25	65.53	122.24	128.94	140.20	135.64	63.69	63.62	62.83	62.16
Married, no children	25.24	36.81	51.36	64.91	123.36	132.86	144.46	145.69	63.73	63.51	62.88	61.59
1 child	25.61	37.16	51.19	65.70	124.14	134.39	149.04	141.47	62.95	63.07	62.86	61.80
2 children	26.83	37.75	51.31	64.76	127.62	135.91	146.27	139.14	62.91	63.07	62.57	61.81
3 children	27.41	38.05	50.88	63.97	138.57	138.54	152.62	137.47	62.82	62.92	62.65	62.35
4 children	[1] 26.33	38.68	51.79	[1] 64.53	[1] 145.00	142.64	149.32	[1] 145.46	[1] 62.87	62.64	62.86	[1] 62.28
5 children	[1] 27.70	39.36	51.89	[1] 64.17	[1] 145.10	147.68	152.15	[1] 151.76	[1] 61.87	63.15	62.48	[1] 61.99
6 children	(2)	[1] 39.98	51.36	[1] 62.79	(2)	[1] 157.33	146.94	[1] 158.93	(2)	[1] 63.05	62.02	[1] 62.47
7 or 8 children	(2)	[1] 39.31	51.35	[1] 64.92	(2)	[1] 143.11	152.17	[1] 148.75	(2)	[1] 62.06	62.24	[1] 61.04
9 or more children	----------	[1] 40.96	52.49	[1] 63.42	----------	[1] 131.54	154.43	[1] 153.31	----------	[1] 63.11	61.62	[1] 61.75

Marital status and number of children borne	Mean bust girth of women aged—				Mean waist girth of women aged—				Mean hip girth of women aged—			
	18–29	30–44	45–59	60 and over	18–29	30–44	45–59	60 and over	18–29	30–44	45–59	60 and over
	Inches	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*
Never been married	33.72	34.76	36.61	36.06	26.17	28.20	30.84	31.45	37.34	38.25	39.65	39.41
Married, no children	34.12	35.49	37.64	38.22	26.59	28.75	31.84	33.33	37.54	38.78	39.88	40.53
1 child	34.35	35.78	38.11	37.05	27.61	29.47	32.48	32.49	37.74	39.07	40.54	39.82
2 children	34.81	35.89	37.83	37.18	28.34	29.66	32.20	31.83	38.24	39.31	40.35	39.32
3 children	36.08	36.41	38.63	36.42	30.09	30.34	33.27	31.37	39.67	39.63	41.19	39.42
4 children	[1] 37.35	36.85	38.10	[1] 38.09	[1] 31.12	31.36	32.74	[1] 33.28	[1] 41.09	40.16	40.91	[1] 40.47
5 children	[1] 36.83	37.49	38.47	[1] 39.27	[1] 31.32	31.77	33.40	[1] 34.52	[1] 41.20	40.61	41.12	[1] 40.99
6 children	(2)	[1] 38.97	38.55	[1] 39.77	(2)	[1] 33.56	33.43	[1] 35.22	(2)	[1] 41.49	40.30	[1] 41.80
7 or 8 children	(2)	[1] 37.44	38.67	[1] 38.43	(2)	[1] 32.12	33.90	[1] 34.72	(2)	[1] 40.26	40.83	[1] 40.86
9 or more children	----------	[1] 35.58	39.58	[1] 39.34	----------	[1] 30.55	34.76	[1] 34.85	----------	[1] 38.67	41.17	[1] 41.88

[1] Average based on less than 50 cases.
[2] Averages not shown for less than 10 cases.

Comparison of Women's Measurements With Those of Girls 15, 16, and 17 Years Old

In the survey of children's measurements, which preceded the present study, data for more than 10,000 girls aged 15, 16, and 17 years were obtained, although few separate tabulations of these data were presented in the report. In the preliminary work for the present survey, considerable analysis was made of these data, and it is interesting to compare the results with those obtained for women 18 years old and over.

As was inevitable, there is some lack of comparability between the data collected in the two surveys. First, administration of the projects was different. The children's study was conducted as a Federal Works Project and thus allowed relatively close supervision from Washington, while the present study combined a number of State Works Projects and a Federal Project.

Second, the States covered are different. The States included for girls 15, 16, and 17—Ohio, Michigan, Illinois, Colorado, and Utah—are all located in the Middle West and Rocky Mountain regions, while Illinois is the only State included in the women's survey that is in these regions. The others are in the East, South, and Pacific Coast areas. Third, certain of the measurements were not taken in identical fashion as will be seen in the descriptions of measurement procedures included in the present and in the earlier publication.

Finally, the sampling procedures by which persons were selected for measurement necessarily differed greatly. Girls 15, 16, and 17 years old were chosen almost entirely from high schools, which probably resulted in underrepresentation of both the high- and low-income groups. Women were chosen in the present study from colleges, offices, department stores, women's clubs, and Work Projects Administration projects. While it is impossible to say that any particular class is not represented, it is unlikely that the representation of the various income classes approximates that for the earlier study.

In spite of these limitations, however, the two studies are basically comparable. Both were organized to provide measurements for garment and pattern construction. Both were sponsored by the United States Bureau of Home Economics, and procedure and analysis in the women's study were patterned after the children's study with comparatively few changes. It is unlikely, therefore, that large differences between the results of the studies could have arisen through disparity in methodology, so that broad comparisons are in order.

Differences in measurements between girls 15, 16, and 17 years old and women 18 and over are nowhere more apparent than in the general averages. Table 28 shows these averages for 13 of the most important measurements. Weight and the seven girth measurements are much larger for women than for adolescent girls, while the 4 height measurements and arm length are more nearly the same, although the girls are slightly taller. These differences are, of course, in the direction to be expected; it is the size of the differences in weight and the girth measurements that is surprising. Nearly 20 pounds in weight, more than 2½ inches in bust and hip girth and more than 3½ inches in waist girth are large differences indeed.

Table 28.—*Means and standard deviations of 13 measurements of 9,435 girls 15, 16, and 17 years old and of 10,042 women 18 years old and over*

Measurement	Mean		Standard deviation	
	Girls 15, 16, and 17	Women 18 and over	Girls 15, 16, and 17	Women 18 and over
	Pounds	*Pounds*	*Pounds*	*Pounds*
Weight	115.82	133.48	15.11	25.98
Vertical measurements:	*Inches*	*Inches*	*Inches*	*Inches*
Stature	63.32	63.16	2.30	2.48
Cervicale height	54.16	54.32	2.16	2.30
Hip height	32.36	31.61	1.60	1.78
Tibiale height	17.46	17.22	.92	1.07
Total posterior arm length	23.10	23.00	1.09	1.17
Vertical trunk girth	56.01	60.08	2.38	3.32
Horizontal measurements:				
Chest girth at armseye	32.44	34.77	1.88	3.20
Bust girth	33.13	35.62	2.01	3.87
Waist girth	25.37	29.15	1.81	4.45
Hip girth	36.04	38.82	2.13	3.34
Maximum thigh girth	20.84	22.24	1.67	2.25
Neck-base girth	14.37	15.27	.64	.93

Without exception, the standard deviations are larger for women than for girls, showing that the latter are a more homogeneous group. By far the largest proportionate difference is in waist girth, with respect to which women are almost 2½ times as variable as girls of 15 to 17 years.

For two illustrative measurements, namely, stature and hip girth, the frequency distributions as well

Table 29.—*Percentage distribution of 9,435 girls 15, 16, and 17 years old and of 10,042 women 18 years old and over, by stature and by hip girth*

Stature			Hip girth		
Centimeters	Girls 15, 16, and 17	Women 18 and over	Centimeters	Girls 15, 16, and 17	Women 18 and over
	Percent	*Percent*		*Percent*	*Percent*
132, 133	0.01	0.01	64, 65	0.01	
134, 135	.01		66, 67	.01	
136, 137		.01	68, 69		
138, 139	.02	.04	70, 71	.02	
140, 141	.04	.17	72, 73	.04	
142, 143	.11	.30	74, 75	.08	
144, 145	.25	.60	76, 77	.20	0.04
146, 147	.66	1.13	78, 79	.67	.16
148, 149	1.23	2.00	80, 81	1.35	.27
150, 151	2.78	3.35	82, 83	3.23	.70
152, 153	5.15	5.38	84, 85	5.77	1.53
154, 155	7.60	8.01	86, 87	10.19	3.09
156, 157	10.61	10.20	88, 89	14.60	5.54
158, 159	12.82	11.98	90, 91	15.72	7.94
160, 161	13.46	13.11	92, 93	14.63	9.56
162, 163	12.55	12.58	94, 95	12.68	10.48
164, 165	11.25	10.40	96, 97	8.09	10.92
166, 167	8.96	7.63	98, 99	5.34	9.72
168, 169	5.32	5.69	100, 101	3.51	8.44
170, 171	3.72	3.45	102, 103	1.93	7.09
172, 173	1.98	1.92	104, 105	.89	5.91
174, 175	.89	1.07	106, 107	.47	4.42
176, 177	.37	.59	108, 109	.22	3.52
178, 179	.13	.20	110, 111	.16	2.82
180, 181	.06	.11	112, 113	.06	2.12
182, 183	.02	.05	114, 115	.06	1.57
184, 185		.01	116, 117	.02	1.17
186, 187		.01	118, 119	.01	.84
			120, 121	.03	.59
			122, 123		.47
			124, 125	.01	.33
			126, 127		.26
			128, 129		.14
			130, 131		.12
			132, 133		.06
			134, 135		.04
			136, 137		.04
			138, 139		.06
			140, 141		.02
			142, 143		.01
			156, 157		.01
Total	100.00	100.00	Total	100.00	100.00

as the two summary statistics in table 28 are available. These distributions, which are in centimeters rather than inches because the distributions in inches were not available for girls, are shown in table 29. The distributions by stature obviously are much alike, but those by hip girth differ widely. Nearly 80 percent of the girls have hips measuring 95 centimeters (about 37½ inches) or less compared with only 40 percent of the women.

The correlations among measurements also show considerable differences between girls and women, although perhaps not to the same degree as some of the distributions of single measurements. Examination of tables 30 and 31 shows differences which, when the correlations are considered in three groups, are entirely consistent. The correlations among girths and weight are distinctly larger for women than for girls, while those among the heights and arm lengths are larger for girls. The greatest differences, however, are in the correlations between a girth or weight on the one hand and a height or arm length on the other. These correlations, which are fairly sizable for girls, several of them being greater than 0.30, are much smaller for women. Six of them, in fact, are actually negative.

The multiple correlations presented in table 32, naturally reflect the differences in the simple correlations. For the heights and arm lengths, the multiple correlations are a trifle higher for girls than for women, but for the girths and weight, the figures for women are much larger.

A more important inference also can be drawn from the multiple correlations. It will be recalled that for women stature and weight are more closely related to the set of body measurements as a whole than are any other pair, and that for this reason stature and weight were recommended as the basis for sizing women's garments. The combination of stature and a trunk girth was found to be next best, and it seemed immaterial which of the four girths—bust, waist, abdominal-extension, or hip—was chosen. The multiple correlations in table 32 indicate, however, that these conclusions do not hold rigidly for girls 15 to 17 years old. The correlations with stature and weight are the largest of the three sets, as is the case for women. Stature and hip girth, however, are probably preferable to stature and bust girth for girls. Hip is almost as good as bust in predicting the waist and neck-base girths of girls, while these are two of the measurements for which bust girth is far superior for women.

Table 30.—*Correlations among 13 measurements of 9,435 girls 15, 16, and 17 years old*

Measurement	Stature	Cervicale height	Hip height	Tibiale height	Total posterior arm length	Vertical trunk girth	Chest girth at armscye	Bust girth	Waist girth	Hip girth	Maximum thigh girth	Neck-base girth
Weight	.5037	.5127	.4061	.4105	.4572	.7498	.8009	.7993	.7878	.9040	.8813	.5882
Stature		[1].9694	[1].8515	[1].7810	.7740	.6118	.2713	.2523	.2148	.3595	.2322	.3856
Cervicale height			[1].8623	[1].7889	.7801	.6099	.2738	.2677	.2372	.3693	.2463	.3547
Hip height				[1].8177	.7732	.3896	.1916	.1939	.1892	.2404	.1667	.2861
Tibiale height					.7312	.3709	.2156	.2242	.1944	.2769	.1894	.2970
Total posterior arm length						.4269	.3007	.2850	.2688	.3355	.2307	.3305
Vertical trunk girth							.5718	.5770	.5373	.6955	.6163	.5058
Chest girth at armscye								.8702	.7425	.7331	.7271	.5481
Bust girth									.7442	.7258	.7258	.5225
Waist girth										.7385	.7157	.5112
Hip girth											.9001	.5255
Maximum thigh girth												.4710

[1] Overlapping measurements.

Table 31.—*Correlations among 13 measurements of 10,042 women 18 years old and over*

Measurement	Stature	Cervicale height	Hip height	Tibiale height	Total posterior arm length	Vertical trunk girth	Chest girth at armscye	Bust girth	Waist girth	Hip girth	Maximum thigh girth	Neck-base girth
Weight	.2109	.2810	.1040	.1178	.3018	.8852	.8915	.8981	.8771	.9190	.8725	.6744
Stature		[1].9512	[1].8346	[1].7269	.7310	.3255	.0510	.0025	−.0711	.1116	.1027	.1652
Cervicale height			[1].8398	[1].7542	.7547	.3887	[2].1318	.0722	.0136	.1771	[2].1537	[2].2159
Hip height				[1].7164	.7224	.1401	−[2].0031	−.0641	−.1066	.0156	[2].0132	[2].1091
Tibiale height					.6115	.1496	[2].0401	−.0194	−.0703	.0369	[2].0479	[2].1146
Total posterior arm length						.3010	[2].1876	.1477	.0991	.2150	[2].1580	[2].2225
Vertical trunk girth							.7929	.7951	.7827	.8113	.7454	.6183
Chest girth at armscye								.9397	.8891	.8023	.7486	.6691
Bust girth									.9177	.8091	.7463	.6472
Waist girth										.8105	.7175	.6332
Hip girth											.9077	.5769
Maximum thigh girth												.5366

[1] Overlapping measurements.
[2] Based on 4,128 women.

It may be thought, perhaps, that the differences between corresponding multiple correlations for girls and women are due to the difference in the distributions of the separate measurements, and that the regression relationship among hip measurements is very nearly the same for the two groups. To test this hypothesis the regression equations corresponding to the multiple correlations just presented were computed, and they are shown in table 33. It will be seen that, while in many cases the regression coefficients for girls and for women correspond more closely than do the multiple correlations, the differences are nevertheless considerable.

From this fact, it might be assumed that girls and women differ so much in their body measurements that separate sizing systems are necessary. This, however, does not seem to be the case. On the assumption that stature and weight are used as the basis for sizing garments, the measurements for women and for girls of medium height for five different weights were computed. The results are shown in table 34. Most of the differences are less than half an inch, the outstanding exception being vertical trunk girth, and in this case the differences are probably due primarily to a difference in measuring technique.

Table 32.—*Multiple correlations of 12 measurements with stature and each of 3 other measurements for 9,435 girls 15, 16, and 17 years old and for 10,042 women 18 years old and over*

Measurement	Multiple correlation with stature and—					
	Weight		Bust girth		Hip girth	
	Girls 15, 16, and 17	Women 18 and over	Girls 15, 16, and 17	Women 18 and over	Girls 15, 16, and 17	Women 18 and over
Weight			.8581	.9221	.9241	.9255
Cervicale height	.9698	.9547	.9697	.9537	.9697	.9538
Hip height	.8519	.8379	.8518	.8373	.8544	.8383
Tibiale height	.7813	.7278	.7815	.7272	.7810	.7282
Total posterior arm length	.7779	.7464	.7795	.7454	.7764	.7432
Vertical trunk girth	.7973	.8965	.7517	.8584	.7963	.8451
Chest girth at armscye	.8154	.9024	.8718	.9410	.7332	.8032
Bust girth	.8180	.9183			.7258	.8139
Waist girth	.8155	.9154	.7448	.9206	.7405	.8266
Hip girth	.9108	.9229	.7483	.8165		
Maximum thigh girth	.9148	.8765	.7276	.7531	.9054	.9077
Neck-base girth	.5972	.6748	.5846	.6676	.5662	.5857

Table 33.—*Regression coefficients of 12 measurements on stature and each of 3 other measurements for 9,435 girls 15, 16, and 17 years old and for 10,042 women 18 years old and over*

Measurement	Increase in measurement for each—											
	1-inch increase in stature, with weight constant		1-pound increase in weight, with stature constant		1-inch increase in stature, with bust-girth constant		1-inch increase in bust girth, with stature constant		1-inch increase in stature, with hip girth constant		1-inch increase in hip girth, with stature constant	
	Girls 15, 16, and 17	Women 18 and over	Girls 15, 16, and 17	Women 18 and over	Girls 15, 16, and 17	Women 18 and over	Girls 15, 16, and 17	Women 18 and over	Girls 15, 16, and 17	Women 18 and over	Girls 15, 16, and 17	Women 18 and over
	Pounds	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*
Weight					2.1197	2.1850	5.3917	6.0252	1.3490	1.1482	5.9026	7.0593
Vertical measurements:	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*
Cervicale height	0.8947	0.8652	0.0047	0.0074	.9043	.8815	.0265	.0415	.9021	.8743	.0243	.0495
Hip height	.6042	.6110	−.0032	−.0052	.5974	.5997	−.0178	−.0305	.6124	.6059	−.0568	−.0419
Tibiale height	.3079	.3169	.0014	−.0015	.3096	.3135	.0133	−.0059	.3131	.3157	−.0019	−.0144
Total posterior arm length	.3453	.3296	.0065	.0070	.3554	.3448	.0519	.0441	.3556	.3378	.0337	.0474
Vertical trunk girth	.3250	.1942	.0933	.1091	.5158	.4325	.5343	.6807	.4304	.3180	.6121	.7800
Horizontal measurements:												
Chest girth at armscye	−.1448	−.1847	.1108	.1134	.0452	.0627	.8004	.7759	.0073	−.0503	.6460	.7726
Bust girth	−.1763	−.3052	.1199	.1400					−.0086	−.1388	.6904	.9499
Waist girth	−.1920	−.1802	.1091	.1597	.0227	−.1315	.6631	1.0541	−.0458	−.2931	.6469	1.1039
Hip girth	−.1188	−.1157	.1363	.1204	.1741	.1475	.7164	.6974				
Maximum thigh girth	−.2066	−.0771	.1135	.0771	.0381	.0914	.5929	.4335	−.0764	.0012	.7387	.6116
Neck-base girth	.0332	.0090	.0223	.0239	.0752	.0610	.1440	.1547	.0627	.0381	.1334	.1569

Table 34.—*Principal measurements for 5 "regular" sizes based on stature of 64 inches and 5 different weights for girls 15, 16, and 17 years old and for women 18 years old and over*

Measurement	Value for stature 64 inches and weight—									
	100 pounds		110 pounds		120 pounds		130 pounds		140 pounds	
	Girls 15, 16, and 17	Women 18 and over	Girls 15, 16, and 17	Women 18 and over	Girls 15, 16, and 17	Women 18 and over	Girls 15, 16, and 17	Women 18 and over	Girls 15, 16, and 17	Women 18 and over
	Pounds	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*
Weight	100.00	100.00	110.00	110.00	120.00	120.00	130.00	130.00	140.00	140.00
Vertical measurements:	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*
Stature	64.00	64.00	64.00	64.00	64.00	64.00	64.00	64.00	64.00	64.00
Cervicale height	54.70	54.82	54.75	54.89	54.80	54.96	54.84	55.03	54.89	55.10
Hip height	32.82	32.28	32.79	32.23	32.76	32.18	32.72	32.13	32.69	32.08
Tibiale height	17.65	17.55	17.66	17.53	17.68	17.51	17.69	17.49	17.71	17.47
Total posterior arm length	23.23	23.05	23.30	23.12	23.36	23.19	23.43	23.26	23.49	23.33
Vertical trunk girth [1]	54.75	56.60	55.68	57.69	56.62	58.78	57.55	59.87	58.48	60.96
Horizontal measurements:										
Chest girth at armscye	30.59	30.84	31.70	31.97	32.81	33.10	33.91	34.23	35.02	35.36
Bust girth	31.11	30.68	32.31	32.08	33.51	33.48	34.71	34.88	35.91	36.28
Waist girth	23.51	23.39	24.60	24.99	25.69	26.59	26.78	28.19	27.87	29.79
Hip girth	33.80	34.71	35.16	35.91	36.53	37.11	37.89	38.31	39.25	39.51
Maximum thigh girth	18.90	19.61	20.04	20.38	21.17	21.15	22.31	21.92	23.44	22.69
Neck-base girth	14.04	14.48	14.26	14.72	14.49	14.96	14.71	15.20	14.92	15.44

[1] For women, vertical trunk girth was measured over the maximum extension of the bust. For girls, the tape passed by the shortest line from the crotch to the middle of the shoulder.

Appendix A

Theoretical Considerations in Sizing Garments and Patterns

A standard set of body measurements for sizing garments and patterns should be flexible and systematic. It must be flexible in that it must include the largest number of sizes that the specialty manufacturer needs and yet be such that, by eliminating the least frequent and the in-between sizes, it can be reduced in successive stages to the smallest number which the mass-production manufacturer wishes to use. System in the choice and arrangement of sizes is necessary if women are to be easily identified with the size fitting them best.

The systematic arrangement of sizes may be obtained by basing the sizing system on one, two, or possibly three control measurements. If only one control measurement is used, weight for example, the sizes are simply arranged in order of increasing weight intervals. If two control measurements are used, say weight, and stature, both measurements may be given, or, as is the case with men's suits, there could be three sequences, "regulars," "longs," and "shorts," not necessarily with the same weight sizes in each sequence.

There are, however, other ways to obtain a systematic array of sizes than by using one or more control measurements. The sizes may be based, for example, on some synthetic measure compounded from a large number of measurements. A compound measure which has certain advantages is the first principal component, and its use as a control is considered here. With such a basis, the sizes would be arranged in order of increasing magnitude of the control. The nomenclature adopted would probably have to be on some arbitrary basis, as is the present system of shoe sizes, rather than representing the numerical values of some anthropometrical measurement.

From the mathematical point of view, if it is assumed that the body measurements of each woman are completely specified by the 55 measurements taken so that a mannequin can be constructed if these measurements are known, then each woman represents a point in a space of 55 dimensions. The problem then is to choose a set of points (let us call them "standard" points) representative of the entire cluster.

Perhaps the most obvious solution is to define the notion of distance between two points and choose the standard points so as to minimize the sum of the squares of the distances from each point in the cluster to the nearest standard point. The usual definition of the square of distance, of course, is the sum of the squares of the differences between corresponding coordinates. The use of this definition or any simple modification of it, however, involves some difficulties.

First, there is the problem of the unit for each measurement. All of the measurements except weight and slope of shoulder were taken in centimeters. Is an error of one centimeter in girth of upper arm, say, more serious than in girth of bust, which is a far larger measurement? If so, a weighted sum of squares must be used. A smaller unit might be chosen, of course, which is equivalent to increasing the weight of the measurement. Clearly the importance of measurements varies from garment to garment. For example, girth of elbow makes no difference at all for a short-sleeved dress nor girth of hips for a bandeau. Considering all of the complications, it seems impossible in the present state of our knowledge to choose units adequately representing all relevant factors.

Second, even if proper units are chosen, the 55 measurements included in the study necessarily constitute a more or less arbitrary selection from an unlimited number of possible measurements. Some of them are highly correlated because they were taken at nearly the same place on the body, for example, girth of bust and girth of chest. One possible method of avoiding this difficulty would be to use a definition of distance in correlated space, with some such formula as $D^2 = \sum_{ij} \sigma^{ij}(x_i - m_i)\ (x_j - m_j)$ where, σ_{ij} being the covariation between the ith and j^{th} measurements, σ^{ij} is the corresponding element in the inverse matrix of these covariances. This definition, however, eliminates not merely the spurious correlations between nearly identical measurements but all correlations. This is not what is desired, for, if girth of hips, for example, is used as the sole control measurement, and a woman is fitted badly

both in the bust and the upper arm by a dress in her hip size, the lack of fit in these two places is none the less serious because bust and upper arm are positively correlated when hip girth is held constant.

With such serious difficulties involved in any attempt to combine the differences in each of the 55 measurements into a definition of distance, it seems advisable to consider each measurement separately. The standard points may then be chosen so as to minimize the residual variance of each measurement. Since no single set of points minimizes the residual variance of every measurement, one set of standard points should be preferred to another if it leaves smaller residual variance in a majority of the more important measurements. The advantage of this solution is simply that it leaves up to judgment a matter which seems impossible, in the present state of knowledge of adequate mathematical formulation.

The minimization of the variances must be brought about subject to the requirements pointed out above. Several possible systems are considered here. Three of these are colinear or quasi-colinear, where the standard points are based on a single control.

Suppose the question is: What line in the space of 55 dimensions minimizes the residual variances of the 55 measurements? The answer clearly depends on the weights used in adding the variances to obtain the sum which is to be minimized, and, as already stated, the proper weights cannot be chosen with a close approach to accuracy. With any particular set of weights, however, the answer will be what is known as the first principal component of the variables for the particular set of weights adopted.

The chief difficulty with sizing on the basis of the first principal component is a practical one: namely, how is each woman to be identified with the standard point nearest her? To take 55 measurements on every woman is obviously out of the question, not to mention the arithmetical computation involved in obtaining the value of the principal component from the 55 measurements. If all measurements were highly correlated, it would be necessary to take only a few, in some cases perhaps only one measurement, in order to obtain a sufficient approximation to the first component. However, as shown in table 4, this is not the case with body measurements of women. Most vertical measurements show only a small correlation with the horizontal measurements. Since all the measurements (except probably shoulder slope) would have positive coefficients,[14] a short stout woman might easily have vertical measurements calling for one of the smallest sizes and horizontal measurements requiring one of the largest.

The point is not that such a woman would be better fitted by some colinear system not based on the first principal component, but merely that it would require so much trouble to find her nearest size that the slight advantage of using the first principal component over using, let us say, weight would be more than counterbalanced. The first principal component, therefore, is not to be recommended as sole control.

The second colinear system considered consists of two steps: (1) The choice of a control measurement, and (2) the computation of the least-squares regression of every other measurement on the control measurement. In the space of 55 dimensions this procedure amounts to choosing the line so as to minimize the sum of the squares of the distance from each point to the line, the distance being measured not perpendicularly to the line as in the case of the first principal component but along the hyperplane over which the control measurement is constant. If curvilinear regression lines are used, the line in hyperspace ceases to be straight, and the system is no longer colinear. Nevertheless, the set of standard points may be set up in exactly the same way.

The advantages of this system are twofold. (1) By the proper choice of a control measurement, the residual variances may be reduced almost as much as with the use of the first principal component. (2) The identification of each woman with her nearest size is simple. It requires only a single measurement.

The chief disadvantage of this system of sizing is the fact already noted, that there is very little correlation between most of the vertical measurements and the horizontal measurements. Thus if a girth or weight is used as control, almost no variation in heights is allowed for. Neither the short woman nor the tall woman is fitted adequately. Obversely, if a height is used as control, very little variation in girths is allowed for. This two-way variation can be allowed for, of course, only by using two control measurements.

After the control measurement is chosen, there still remains the problem of selecting the numerical values of the control measurement. For any given number of points, the set which minimizes the residual variances is not equally spaced. On the contrary, it has smaller intervals around the modal group and larger intervals at the tails of the distribution. Such a set of sizes, however, is lacking

[14] If all correlations are positive, all coefficients have the same sign, as is easily shown. Starting with any first approximation in which all coefficients are positive, every product added to obtain the coefficients in the second approximation is positive, and therefore the second approximation has only positive coefficients. By the same reasoning the third and each succeeding approximation consists of only positive coefficients. A few negative coefficients appear in the correlation matrix shown in table 4, to be sure, but there can be no doubt that they would be unable to offset the large majority of positive correlations even between vertical and horizontal measurements.

in flexibility as well as simplicity, and probably the use of equispaced intervals, as is now the practice, is preferable.

The third system of sizing, which is quasi-colinear, yields results which differ little numerically from those of the second system. It consists of three steps: (1) The choice of a control measurement; (2) the choice of the numerical values of the control measurement to be used as the standard points and the partition of all women into groups according to the standard point nearest them on the basis of the control measurement; and (3) the calculation for each group of women of the average value for each of the 55 measurements.

If the true regression of each of the 55 measurements on the control measurement is linear, the standard points will approach colinearity as the size of the sample increases. In such a case the second system by using regression lines eliminates more of the sampling variation and is to be preferred, particularly in small samples. Also the results are simpler to use since the gradations between sizes are equal if equispaced intervals are used, and otherwise are proportional. Finally, the computation of regressions is less laborious than that of averages, since the correlations must be computed for other purposes, in any case.

This method was not used in the present report for three reasons: The sample of women in the present survey is not large enough to reduce sampling errors to negligible proportions; very few of the regression lines depart greatly from linearity; and the work involved in setting up alternative sizing schemes would have been comparatively great.

As was pointed out above, all colinear and quasi-colinear systems suffer from the very great defect that heights and girths have only small correlations with each other. This two-way variation requires a plane to represent it, and coplanar systems must, therefore, be considered.

Three coplanar systems, corresponding to the three colinear systems already presented, are possible bases for sizing. They are based on: (1) The first and second principal components; (2) two control measurements, such as weight and stature, representative of horizontal and vertical measurements with the numerical values of the other measurements computed from two-way regressions; and (3) two control measurements with the numerical values of the other measurements obtained by partitioning women into groups on the basis of the control measurements and computing an average for every measurement for each group.

The first and third systems have the same disadvantages as their colinear cousins but to a greater degree. The superiority of the second system for the data at hand seems clear.

Combinations of the above systems are, of course, possible. Only one of them, however, seems to warrant serious consideration, namely, the combination of a measurement with a component orthogonal to it. The measurement should be weight or a body girth, since the body girths are the most important in garment construction. The component should be the first principal component calculated from the partial correlations holding the control measurement constant. Such a component would be made up largely of heights, and three sets of sizes could be constructed, "regulars," "longs," and "shorts."

The problem of overlapping measurements enters here, however. All the heights except sitting height were measured from the floor. The result is that the length of the lower leg is a constituent part of nine different measurements. It thus receives very heavy weight in computing the principal component. To put the problem in another way, if the same women had been measured, but the height measurements, instead of being taken as heights above the floor, had been taken as depths below the level of the top of the head, a very different principal component would have been found. Futhermore since the vertical segments of the body must add up to stature, there is probably little advantage in using any sort of component rather than using stature itself.

All things considered the best coplanar system is probably two control measurements with regressions.

Two control measurements, if properly chosen, seem to determine almost all other measurements fairly well. It may be, therefore, that a third control measurement is not required. If a third control is to be used, however, it should be a component orthogonal to the first and second controls. Such a component would reflect principally the variation between upper and lower body girths and this would avoid objection based on overlapping measurements. It would be used merely to obtain "stouts" and "slims."

Probably not all measurements should be included in the second order partial correlation matrix from which the first principal component is computed. Overlapping measurements should be eliminated to avoid misweighting, and insignificant measurements should be omitted to reduce the labor involved. In the only principal component computed as a basis for sizing in this report, the number of variables was reduced to six without, it is believed, resulting in more than a negligible loss in accuracy.

Appendix B

The following 18 tables (35 to 52) were considered too detailed for inclusion in the text. Since they provide basic information on women's measurements of a type not now available, however, they have been included in this appendix. Some of them, particularly the bivariate distributions, may also interest statisticians.

In these tables age is measured in completed years; thus women who have passed their 18th but not their 19th birthday are entered as age 18. Weight and shoulder slope are entered as reported on the schedule. Measurements in centimeters show the whole number of centimeters reported on the schedule, with the millimeters neglected; thus measurements of both 79.0 and 79.9 centimeters on the schedule are entered as 79. Measurements in inches show the whole number of inches (neglecting fractions) obtained by multiplying the number of millimeters on the schedule by 0.03937; thus both 124.5 and 127.0 centimeters are entered as 49 inches. Some of the 1-inch intervals are 26-millimeter intervals and some are 25-millimeter intervals.

Table 35.—*Frequency distributions, means, and standard deviations of 2,664 women excluded from the analysis, by age, weight, stature, bust girth, and hip girth*

Age		Weight		Stature		Bust girth		Hip girth	
Years	Frequency	Pounds	Frequency	Centimeters	Frequency	Centimeters	Frequency	Centimeters	Frequency
18	509	80– 84	6	139	1	71	2	68	1
19	574	85– 89	9			72	5	69	----------
		90– 94	27	140	----------	73	5		
20	415	95– 99	84	141	----------	74	11	70	----------
21	236			142	2	75	19	71	----------
22	131	100–104	168	143	2	76	32	72	----------
23	130	105–109	226	144	3	77	49	73	----------
24	92	110–114	340	145	4	78	69	74	----------
25	88	115–119	309	146	2	79	92	75	----------
26	90	120–124	342	147	10			76	----------
27	63	125–129	284	148	13	80	123	77	----------
28	55	130–134	259	149	21	81	160	78	----------
29	68	135–139	183			82	189	79	2
		140–144	130	150	21	83	199		
30	15	145–149	90	151	32	84	205	80	3
31	7			152	27	85	211	81	2
32	16	150–154	63	153	67	86	190	82	11
33	18	155–159	42	154	65	87	197	83	23
34	12	160–164	29	155	86	88	144	84	24
35	17	165–169	22	156	103	89	158	85	43
36	12	170–174	10	157	114			86	51
37	13	175–179	6	158	145	90	104	87	85
38	10	180–184	7	159	161	91	102	88	107
39	16	185–189	7			92	75	89	129
		190–194	7	160	180	93	70		
40	13	195–199	5	161	188	94	51	90	149
41	15			162	172	95	34	91	159
42	16	200–204	2	163	170	96	20	92	182
43	9	205–209	1	164	178	97	27	93	188
44	12	210–214	1	165	154	98	19	94	199
45	1	215–219	----------	166	136	99	20	95	186
46	3	220–224	2	167	111			96	156
47	2	225–229	2	168	111	100	18	97	176
48	1	230–234	----------	169	75	101	9	98	133
49	----------	235–239	1			102	6	99	117
				170	84	103	3		
50	----------			171	57	104	7	100	99
51	----------			172	41	105	4	101	97
52	----------			173	44	106	7	102	64
53	----------			174	31	107	4	103	61
54	1			175	19	108	4	104	43
55	2			176	15	109	----------	105	34
56	----------			177	7			106	27
57	1			178	5	110	1	107	27
58	----------			179	1	111	5	108	16
59	----------					112	2	109	15
				180	2	113	2		
60	----------			181	2	114	3	110	9
61	----------			182	2	115	----------	111	6
62	----------					116	2	112	3
63	1					117	2	113	6
						118	----------	114	5
						119	2	115	2
								116	3
						120	----------	117	7
						121	----------	118	1
						122	----------	119	1
						123	----------		
						124	----------	120	2
						125	1	121	2
								122	1
								123	3
								124	1
								125	2
								126	1
Total	2,664	Total	2,664	Total	2,664	Total	2,664	Total	2,664
Mean	22.72	Mean	123.91	Mean	162.54	Mean	86.51	Mean	95.40
Standard deviation	5.59	Standard deviation	18.01	Standard deviation	6.06	Standard deviation	6.16	Standard deviation	6.24

Table 36.—*Frequency distributions of 10.042 women by age and by 59 measurements*

Years	Number of women of given age	Pounds	Number of women of given weight	Pounds	Number of women of given weight	Inches	Number of women of given— Stature	Bust girth	Hip girth	Centimeters	Number of women of given— Stature	Cervicale height	Centimeters	Number of women of given— Bust height	Waist height	Centimeters	Number of women of given— Abdominal-extension height	Hip height	Sitting-spread height	Croteh height	Centimeters	Number of women of given— Tibiale height	Ankle height	Total posterior arm length	Upper posterior arm length	Anterior arm length	Centimeters	Number of women of given sitting height	Centimeters	Number of women of given vertical trunk girth
		75	(1)	155	97																									
		76		156	79	26		6																						
		77	1	157	52	27		9																						
18	406	78	1	158	58	28		38																			38	1		
19	387	79	2	159	83	29		184	1				79		2												39			
20	355	80	2	160	82	30		395	13				80		1												40			
21	405	81	1	161	55	31		844	30	111		1	81														41			
22	328	82	1	162	69	32		1,204	100	112			82			52				1							42			
23	303	83	3	163	48	33		1,359	224	113		1	83		1	53			1		3		1				43			
24	270	84	9	164	52	34		1,281	613	114		1	84	1	4	54			2	2	4		1				44		124	1
25	301	85	10	165	63	35		1,006	943	115			85		5	55			3	4	5		70				45		125	
26	274	86	6	166	50	36		763	1,223	116		1	86		11	56			2	4	6		1,518				46		126	
27	272	87	12	167	42	37		702	1,425	117		1	87	1	15	57			3	5	7		5,734				47		127	1
28	240	88	7	168	42	38		473	1,300	118		4	88	1	19	58			5	10	8		2,530				48	1	128	1
29	281	89	6	169	36	39		406	1,098	119		3	89		45	59			10	19	9		174				49	1	129	2
30	246	90	26	170	58	40		327	866	120		14	90		65	60			16	25	10		12				50	2	130	2
31	246	91	20	171	40	41		291	627	121		18	91	1	90	61		1	28	33	11		2				51	10	131	4
32	265	92	20	172	28	42		211	472	122		34	92	1	111	62	1	1	42	68	12						52	13	132	13
33	270	93	19	173	29	43		158	361	123		29	93	1	210	63		2	63	112	13						53	18	133	14
34	258	94	35	174	30	44		134	250	124		38	94	7	268	64		2	92	148	14						54	46	134	34
35	251	95	45	175	36	45		80	169	125		75	95	5	351	65		8	129	251	15						55	70	135	31
36	223	96	43	176	35	46		57	114	126		88	96	10	417	66		12	249	352	16						56	171	136	45
37	229	97	37	177	19	47		34	73	127		123	97	9	547	67		9	361	409	17						57	286	137	63
38	222	98	58	178	28	48		31	48	128		168	98	17	675	68	1	29	440	610	18						58	502	138	92
39	290	99	53	179	31	49		18	39	129		226	99	32	765	69	2	43	528	702	19						59	752	139	138
40	240	100	80	180	48	50		13	18	130		276	100	29	759	70		85	686	874	20						60	1,041	140	153
41	239	101	87	181	31	51	1	5	13	131	1	375	101	71	884	71	1	113	777	915	21						61	1,351	141	205
42	207	102	83	182	36	52		6	5	132		398	102	80	769	72	2	208	860	985	22						62	1,445	142	242
43	204	103	76	183	21	53		3	6	133		511	103	122	841	73	3	269	877	848	23						63	1,340	143	331
44	209	104	121	184	29	54	6	2	7	134		559	104	157	687	74	8	374	858	817	24				2		64	1,092	144	354
45	203	105	146	185	43	55	22		2	135		650	105	221	569	75	7	501	868	723	25						65	808	145	440
46	196	106	131	186	21	56	59		1	136		682	106	248	471	76	3	618	779	596	26				3		66	515	146	433
47	194	107	102	187	21	57	127	1		137	2	690	107	315	415	77	17	741	650	491	27				8		67	300	147	492
48	172	108	117	188	13	58	248	1		138	1	713	108	352	333	78	20	821	542	360	28				36		68	156	148	487
49	168	109	158	189	21	59	550			139	5	740	109	489	267	79	28	877	373	228	29				181	3	69	79	149	566
50	174	110	194	190	26	60	857			140	12	620	110	557	142	80	47	892	264	170	30	1			491	1	70	32	150	481
51	144	111	167	191	16	61	1,255			141	5	596	111	605	112	81	74	901	192	104	31				1,070	4	71	17	151	526
52	128	112	213	192	14	62	1,606		1	142	14	481	112	615	66	82	121	792	138	77	32	3			1,639	10	72	7	152	476
53	131	113	125	193	19	63	1,661			143	27	429	113	689	37	83	171	670	77	30	33	5			2,133	20	73	7	153	448
54	102	114	173	194	10	64	1,442			144	27	350	114	677	42	84	226	590	59	38	34	1			1,931	34	74	1	154	490
55	139	115	230	195	17	65	972			145	39	317	115	661	22	85	291	457	27	14	35	18			1,349	83	75	4	155	417
56	108	116	181	196	10	66	640			146	58	225	116	710	8	86	357	335	16	8	36	63			722	184	76	2	156	375
57	100	117	124	197	13	67	337			147	71	171	117	621	7	87	504	236	10	3	37	95			303	353	77	1	157	345
58	80	118	172	198	9	68	153			148	101	137	118	572	1	88	602	167	5	3	38	207			123	546	78	1	158	296
59	90	119	179	199	9	69	75			149	128	86	119	459	3	89	700	99	6	2	39	392			42	864	79	2	159	271
60	78	120	270	200	13	70	20			150	169	65	120	401	1	90	818	75			40	699			8	1,225	80	1	160	210
61	71	121	179	201	13	71	7			151	207	52	121	352	1	91	799	53	3		41	977				1,369	81		161	231
62	71	122	196	202	4	72	3			152	277	31	122	270	1	92	832	29	1		42	1,338				1,409	82	1	162	182
63	56	123	155	203	10	73	1			153	318	17	123	201	1	93	807	12			43	1,518				1,237	83		163	165
64	41	124	207	204	9					154	408	17	124	142		94	789	5		1	44	1,509				1,084	84		164	144
65	33	125	218	205	10					155	475	8	125	102		95	660	7			45	1,220		1		710	85	1	165	126
66	26	126	181	206	8					156	493	8	126	80		96	579	1			46	891		2	1	449	86	1	166	126
67	24	127	144	207	6					157	589	5	127	49		97	452	3			47	569				234			167	105
68	15	128	155	208	5					158	600	2	128	48		98	351	3			48	293		2		125			168	64
69	17	129	165	209	8					159	619	3	129	24		99	270	1			49	129		17		69			169	66
70	15	130	219	210	17					160	687	1	130	18		100	164				50	62		33		19			170	59
71	7	131	169	211	7					161	639	1	131	5		101	126				51	20		78		7			171	53
72	5	132	148	212	5					162	649	1	132	5		102	76				52	17		180		1			172	47
73	6	133	119	213	5					163	592		133	5		103	44				53	7		322		2			173	42
74	3	134	181	214	3					164	525		134	1	1	104	36				54	3		568					174	25
75	3	135	198	215	10					165	447		135	1		105	19				55			810					175	22
76	6	136	136	216	3					166	360		136	1		106	14				56	2		1,061					176	27
77	6	137	108	217	3					167	365		137			107	10				57	1		1,302					177	14
78	2	138	143	218	3					168	280		138			108	4				58	1		1,380					178	12
79		139	133	219	6					169	217		139	1		109	3				59	1		1,378					179	11
80	3	140	146	220	5					170	178					110	2				60			1,020					180	7
81	1	141	123	221	1					171	119					111					61			750					181	6
82	3	142	136	222	5					172	96					112					62			491					182	7
		143	81	223	2					173	76					113	1				63			306					183	2
		144	101	224	1					174	52										64			160					184	4
		145	137	225	4					175	34										65			97					185	1
		146	85	226	5					176	32										66			51					186	7
		147	83	227	1					177	19										67			24					187	2
		148	86	228	3					178	6										68			5					188	2
		149	84	229	5					179	10										69			3					189	1
		150	95	230	2					180	4										70			1					190	
		151	85	231	3					181	3																		191	
		152	88	232	2					182	2																		192	
		153	56	233	1					183	3																		193	1
		154	66	234						184																			194	
				235	1					185																			195	
				236	1					186	1																		196	
				237	2																								197	1
				238																									198	1
				[1]239	2																									

See footnotes at end of table.

Table 36.—*Frequency distributions of 10,042 women by age and by 59 measurements*—Continued

Centimeters	Number of women of given— Cervicale to waist, anterior	Anterior waist length	Shoulder to waist	Neck to bust	Posterior waist length	Seye depth	Trunk line	Arm length, shoulder to seye	Waist to hip
8								1	
9								42	
10								247	
11						1	2	900	
12						5	22	1,780	1
13						7	51	2,375	
14						47	186	2,089	2
15						190	426	1,442	11
16						563	718	716	39
17						1,182	1,224	291	107
18				1		1,753	1,641	115	258
19				10		2,019	1,790	32	550
20				26		1,645	1,533	11	940
21		1		78		1,156	1,138	1	1,493
22		2		242		748	692		1,740
23		2		510		402	367		1,747
24		3		946		184	151		1,329
25		11	1	1,124		94	53		865
26		28	2	1,314		28	29		477
27		105	2	1,286	3	10	13		253
28		233	4	1,076	1	5	2		124
29		606	2	882	6	3	2		59
30		1,068	4	669	9		2		23
31		1,566	10	537	23				12
32		1,863	26	459	68				6
33	1	1,764	69	300	237				3
34	1	1,291	175	215	537				3
35	5	761	387	120	993				
36	4	395	722	90	1,448				
37	5	192	1,110	55	1,749				
38	7	87	1,510	37	1,621				
39	14	39	1,726	21	1,352				
40	22	14	1,464	18	953				
41	33	3	1,108	12	512				
42	112	6	752	5	281				
43	192		461	6	148				
44	432	1	239	2	64				
45	764		128		22				
46	1,187		69	1	12				
47	1,508	1	26		2				
48	1,509		18						
49	1,423		17		1				
50	1,105		5						
51	714								
52	439		1						
53	259		1						
54	148		1						
55	81								
56	30		1						
57	21								
58	11		1						
59	9								
60	3								
61	2								
62	1								

Centimeters	Number of women of given— Total crotch length	Anterior crotch length
24		5
25		1
26		5
27		17
28		47
29		109
30		201
31		390
32		615
33		881
34		1,033
35		1,125
36		1,108
37		1,050
38		854
39		655
40		532
41		387
42		293
43		229
44		154
45		109
46		90
47		53
48		34
49		30
50		12
51		8
52	1	5
53		6
54		1
55	3	1
56	1	2
57	3	
58	4	
59	9	
60	10	
61	14	
62	43	
63	50	
64	113	
65	122	
66	247	
67	355	
68	437	
69	553	
70	607	
71	625	
72	706	
73	667	
74	686	
75	634	
76	561	
77	529	
78	484	
79	462	
80	357	
81	309	
82	256	
83	250	
84	172	
85	147	
86	124	
87	125	
88	83	
89	63	
90	50	
91	37	
92	41	
93	28	
94	22	
95	11	
96	13	
97	6	
98	6	
99	16	

Centimeters	Number of women of given— Chest girth at armseye	Bust girth
67	1	1
68	4	5
69	4	2
70	5	5
71	5	9
72	24	13
73	25	31
74	62	55
75	84	88
76	133	92
77	205	155
78	292	222
79	376	312
80	471	340
81	508	441
82	587	464
83	564	501
84	623	509
85	580	560
86	559	521
87	514	483
88	451	510
89	492	428
90	375	401
91	333	342
92	332	325
93	253	273
94	241	279
95	215	263
96	205	226
97	201	189
98	170	185
99	158	168
100	163	162
101	119	152
102	113	129
103	87	131
104	95	124
105	79	108
106	52	103
107	44	90
108	47	74
109	38	75
110	30	68
111	24	48
112	18	57
113	16	57
114	14	30
115	8	36
116	15	32
117	4	22
118	10	24
119	5	21
120	1	13
121		8
122	2	9
123	2	13
124	1	16
125		4
126	1	7
127	1	2
128		3
129		9
130	1	3
131		1
132		3
133		3
134		
135		
136		3
137		
138		2
139		
140		
141		
142		
143		
144		
145		
146		1
147		
148		
149		1

Centimeters	Number of women of given waist girth
45	1
46	
47	
48	
49	
50	2
51	
52	1
53	2
54	6
55	11
56	28
57	43
58	88
59	102
60	220
61	275
62	375
63	426
64	479
65	544
66	515
67	489
68	496
69	477
70	443
71	374
72	373
73	313
74	307
75	254
76	253
77	224
78	216
79	209
80	183
81	182
82	155
83	166
84	153
85	137
86	117
87	111
88	117
89	121
90	93
91	84
92	83
93	65
94	75
95	78
96	76
97	63
98	53
99	44
100	48
101	42
102	29
103	26
104	19
105	29
106	23
107	14
108	19
109	13
110	12
111	15
112	12
113	8
114	4
115	3
116	2
117	4
118	3
119	3
120	4
121	1
122	2
123	
124	1
125	1
126	
127	1
128	
[2] 129	

Centimeters	Number of women of given— Abdominal-extension girth	Hip girth	Sitting-spread girth
65	(3)		
66	2		
67	3		
68	5		3
69	15		
70	23		
71	28		2
72	42		1
73	56		1
74	109		5
75	126		4
76	168	2	4
77	213	5	15
78	250	8	28
79	303	10	28
80	316	11	46
81	396	23	55
82	403	30	75
83	384	56	115
84	422	78	143
85	415	97	185
86	390	138	216
87	374	246	308
88	357	277	347
89	379	312	399
90	303	419	439
91	293	446	435
92	316	486	460
93	283	503	483
94	265	527	512
95	233	549	415
96	232	551	444
97	232	541	464
98	197	477	404
99	189	457	409
100	153	429	302
101	196	381	312
102	174	354	325
103	148	336	309
104	137	300	251
105	151	252	224
106	127	222	184
107	128	191	191
108	108	170	165
109	105	175	151
110	111	138	134
111	76	115	120
112	85	117	110
113	69	77	106
114	64	80	74
115	54	79	68
116	43	53	65
117	34	49	73
118	49	44	59
119	38	31	49
120	41	27	40
121	30	33	41
122	25	20	26
123	24	22	27
124	18	15	38
125	22	14	16
126	23	14	14
127	13	10	20
128	14	7	15
129	8	4	11
130	8	8	14
131	5	4	16
132	6	3	5
133	6	1	4
134	2	2	4
135	4	3	10
136	2	2	1
137	3	2	4
138	2	4	4
139	3	1	
140	1	2	3
141	2		
142			1
143		1	
144	3		3
145	1		2
146			
147			1
148			
[3] 149	(4)	(5)	

Centimeters	Number of women of given— Maximum thigh girth	Midway thigh girth	Bent knee girth	Knee girth at tibiale	Maximum calf girth
20				1	
21				2	1
22				1	4
23			4	19	19
24					4
25			1	2	2
26			4	4	13
27			14	7	44
28		1	33	40	154
29			79	111	321
30		1	217	296	646
31			380	577	1,091
32		1	714	950	1,401
33		2	1,025	1,287	1,408
34	1	3	1,288	1,565	1,380
35		4	1,320	1,352	1,129
36		20	1,267	1,075	832
37	1	20	1,011	869	556
38	2	31	757	616	379
39	1	60	604	414	232
40	5	101	399	278	166
41	4	194	284	191	100
42	15	304	185	148	71
43	24	423	154	92	37
44	48	511	94	48	16
45	67	645	51	38	12
46	119	741	51	18	10
47	175	878	33	17	4
48	277	839	29	6	4
49	334	856	17	9	1
50	487	720	8	2	2
51	575	726	9	1	1
52	636	601	2	2	1
53	694	498	2	3	
54	744	408	2		
55	769	333	1	1	1
56	751	240	1		
57	713	240			
58	620	149	1		
59	498	126			
60	468	103			
61	387	63			
62	327	51	1		
63	259	42			
64	254	24			
65	172	23			
66	146	16			
67	120	16			
68	87	9			
69	63	9			
70	63	3			
71	26	1			
72	25	1			
73	23	4			
74	14				
75	12	1			
76	12				
77	9				
78	5				
79	2				
80	3				
81					
82	2				
83	2				
84					
85					
86	1				

See footnotes at end of table.

Table 36.—*Frequency distributions of 10,042 women by age and by 59 measurements*—Continued

Centimeters	Number of women of given—																Degrees	Number of women of given shoulder slope
	Minimum leg girth	Ankle girth	Neck-base girth	Armscye girth	Upper-arm girth	Elbow girth	Forearm girth	Waist girth	Shoulder length	Anterior chest width	Highest bust-level width	Posterior chest width	Anterior bust arc	Anterior waist arc	Abdominal-extension arc	Posterior hip arc		
																	6	1
7									10								7	1
8									68								8	1
9									478								9	3
10									1,946								10	11
11									3,251		10						11	13
12								12	2,723		18						12	44
13								547	1,132		70						13	51
14								3,324	338		170						14	94
15	1							4,060	81		483						15	176
16	25	1						1,642	12		1,102						16	191
17	122				1		2	384	2		1,815						17	266
18	688	3			1		2	58			2,091						18	456
19	1,773	46			2	2	27	12			1,801						19	592
20	2,411	272			19	8	129	1		1	1,132						20	814
21	2,322	1,045			53	52	470	1	1	2	747						21	742
22	1,429	2,210			161	360	1,303				329	2					22	897
23	696	2,622			366	864	1,899			3	171	1					23	922
24	328	1,986			689	1,543	2,104			8	72	4		1			24	1,007
25	156	1,045	1		1,007	2,021	1,568			20	20	9		1			25	940
26	51	459	3		1,202	1,822	1,088			73	3	39				1	26	844
27	19	218	2		1,134	1,406	680			265	4	95		1			27	618
28	6	64	4	2	1,107	859	346			622	3	216		8		1	28	434
29	5	29	2	1	901	504	238	1		1,208		479		18			29	345
30	1	7	2	1	756	259	96			1,710		697	1	49	1		30	269
31	2	2	8	6	633	164	46			1,868		987	1	105		1	31	129
32	4	19	12	29	527	82	20			1,606		1,315		242			32	75
33	2	9	44	75	444	42	16			1,136	1	1,372	2	371	2	1	33	51
34	1	4	221	243	303	28	3			775		1,341	5	542	5	3	34	28
35			583	409	227	11	1			370		1,074		677	4	3	35	18
36			1,175	699	164	6	2			186		807	12	715	10	11	36	5
37			1,670	937	115	5	1			102		573	25	784	28	24	37	4
38		1	1,934	1,013	74	1				49		392	31	703	62	44		
39			1,712	1,180	69	3	1			24		249	80	720	128	69		
40			1,052	1,043	33					7		149	120	556	197	156		
41			691	903	16					1		97	217	533	316	248		
42			433	794	13							74	323	448	479	412		
43			230	666	10					2		35	415	402	632	537		
44			121	551	4					3		22	515	381	704	726		
45			75	409	4					1		5	578	326	686	802		
46			35	305	2							1	696	286	707	901		
47			22	247	3							5	696	241	693	901		
48			4	168								1	708	231	621	850		
49			3	119	2							1	698	208	573	836		
50			2	88									639	205	477	721		
51				55									525	185	425	540		
52				38									479	148	410	478		
53			1	26									432	127	381	394		
54				14									416	138	342	353		
55				8									349	111	294	244		
56				7									275	106	249	186		
57				2									266	99	219	147		
58				3									234	69	235	116		
59													239	62	189	106		
60													175	48	191	66		
61				1									148	40	128	42		
62													122	25	125	29		
63													108	35	108	24		
64													86	15	89	20		
65													75	19	76	18		
66													75	20	55	5		
67													63	12	41	6		
68													44	9	37	7		
69													39	5	28	1		
70													30	4	27	3		
71													25	3	21	2		
72													22	2	11	1		
73													13		12	1		
74													18	2	11	2		
75													4	2	4			
76													4	1	3			
77													5		4	1		
78													1			2		
79													3	1				
80													1					
81															2			
82													2					
83													1					
84																		
85													1					

Table 36.—*Frequency distributions of 10,042 women by age and by 59 measurements*—Continued

Women not wearing foundation garments							Women wearing foundation garments																	
							Skin measurements							Measurements over foundation garments										
Centimeters	Number of women of given bust girth	Centimeters	Number of women of given waist girth	Centimeters	Number of women of given abdominal-extension girth	Number of women of given hip girth	Centimeters	Number of women of given bust girth	Centimeters	Number of women of given waist girth	Centimeters	Number of women of given abdominal-extension girth	Number of women of given hip girth	Centimeters	Number of women of given bust girth	Centimeters	Number of women of given waist girth	Centimeters	Number of women of given abdominal-extension girth	Number of women of given hip girth
	------	45	[2] 1	------	(3)	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
	------	46	------	66	2	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
67	1	47	------	67	3	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
68	5	48	------	68	5	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
69	2	49	------	69	15	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
70	5	50	2	70	22	------	------	------	------	------	70	1	------	------	------	------	------	------	------	------
71	9	51	------	71	26	------	------	------	------	------	71	2	------	------	------	------	------	------	------	------
72	13	52	1	72	42	------	------	------	------	------	72	------	------	72	1	------	------	------	------	------
73	31	53	2	73	56	------	------	------	------	------	73	------	------	73	------	------	------	73	2	------
74	54	54	6	74	106	------	74	1	------	------	74	3	------	74	4	------	------	74	3	------
75	83	55	11	75	121	------	75	5	------	------	75	5	------	75	2	55	1	75	7	------
76	88	56	27	76	161	2	76	4	56	1	76	5	------	76	5	56	------	76	11	------
77	149	57	43	77	204	5	77	6	57	------	77	9	------	77	7	57	------	77	4	------
78	209	58	83	78	235	8	78	13	58	5	78	15	------	78	9	58	2	78	9	1
79	294	59	98	79	294	10	79	18	59	4	79	9	------	79	10	59	7	79	11	1
80	328	60	211	80	304	10	80	12	60	9	80	12	1	80	19	60	10	80	20	1
81	419	61	265	81	380	21	81	22	61	10	81	16	2	81	21	61	6	81	20	2
82	433	62	361	82	379	27	82	31	62	14	82	24	3	82	21	62	6	82	15	1
83	475	63	413	83	367	56	83	26	63	13	83	18	------	83	25	63	20	83	25	4
84	472	64	462	84	398	74	84	37	64	17	84	24	4	84	35	64	17	84	26	5
85	523	65	514	85	387	91	85	37	65	30	85	28	6	85	40	65	21	85	27	9
86	486	66	489	86	362	132	86	35	66	26	86	28	6	86	34	66	21	86	26	18
87	442	67	458	87	348	232	87	41	67	31	87	26	14	87	38	67	20	87	40	12
88	469	68	465	88	328	261	88	41	68	31	88	29	16	88	31	68	37	88	26	21
89	385	69	441	89	353	289	89	43	69	36	89	26	23	89	42	69	37	89	40	28
90	358	70	410	90	275	399	90	43	70	33	90	28	20	90	40	70	25	90	42	25
91	306	71	345	91	262	418	91	36	71	29	91	31	28	91	34	71	28	91	27	37
92	291	72	336	92	280	452	92	34	72	37	92	36	34	92	32	72	27	92	35	22
93	247	73	285	93	249	480	93	26	73	28	93	34	23	93	37	73	36	93	37	40
94	239	74	273	94	240	486	94	40	74	34	94	25	41	94	29	74	38	94	30	41
95	220	75	215	95	209	506	95	43	75	39	95	24	43	95	36	75	31	95	44	46
96	195	76	217	96	189	515	96	31	76	36	96	43	36	96	39	76	26	96	38	39
97	162	77	192	97	192	502	97	27	77	32	97	40	39	97	39	77	35	97	42	40
98	144	78	176	98	171	424	98	41	78	40	98	28	53	98	31	78	32	98	50	42
99	141	79	173	99	156	404	99	27	79	36	99	33	53	99	29	79	43	99	33	49
100	130	80	151	100	122	372	100	32	80	32	100	31	57	100	36	80	29	100	23	40
101	123	81	151	101	153	332	101	29	81	31	101	43	49	101	30	81	33	101	34	53
102	101	82	134	102	146	303	102	28	82	21	102	28	51	102	28	82	41	102	29	50
103	100	83	126	103	109	286	103	31	83	40	103	39	50	103	30	83	23	103	35	39
104	103	84	121	104	104	254	104	21	84	32	104	33	46	104	26	84	28	104	30	47
105	88	85	108	105	113	202	105	20	85	29	105	38	50	105	26	85	38	105	25	30
106	78	86	92	106	95	177	106	25	86	25	106	32	45	106	20	86	39	106	22	45
107	71	87	85	107	105	150	107	19	87	26	107	23	41	107	21	87	33	107	19	40
108	65	88	92	108	79	141	108	9	88	25	108	29	29	108	22	88	23	108	18	43
109	54	89	98	109	85	131	109	21	89	23	109	20	44	109	19	89	24	109	22	26
110	52	90	69	110	93	109	110	16	90	24	110	18	29	110	11	90	17	110	23	23
111	32	91	65	111	62	100	111	16	91	19	111	14	15	111	13	91	27	111	16	18
112	42	92	69	112	66	93	112	15	92	14	112	19	24	112	24	92	19	112	18	29
113	40	93	46	113	53	55	113	17	93	19	113	16	22	113	13	93	25	113	14	19
114	23	94	57	114	48	62	114	7	94	18	114	16	18	114	12	94	19	114	10	20
115	25	95	58	115	44	57	115	11	95	20	115	10	22	115	9	95	14	115	8	16
116	21	96	62	116	31	44	116	11	96	14	116	12	9	116	10	96	22	116	3	13
117	19	97	42	117	26	33	117	3	97	21	117	8	16	117	7	97	17	117	10	16
118	13	98	43	118	34	31	118	11	98	10	118	15	13	118	8	98	22	118	19	16
119	13	99	36	119	29	26	119	8	99	8	119	9	5	119	4	99	12	119	13	11
120	6	100	31	120	30	18	120	7	100	17	120	11	9	120	6	100	11	120	8	10
121	6	101	32	121	21	21	121	2	101	10	121	9	12	121	6	101	11	121	5	6
122	7	102	22	122	15	13	122	2	102	7	122	10	7	122	5	102	4	122	8	12
123	13	103	19	123	18	13	123	------	103	7	123	6	9	123	4	103	10	123	9	3
124	13	104	13	124	12	11	124	3	104	6	124	6	4	124	4	104	9	124	6	8
125	4	105	16	125	15	11	125	------	105	13	125	7	3	125	1	105	7	125	2	2
126	6	106	19	126	13	11	126	1	106	4	126	10	3	126	1	106	4	126	3	6
127	2	107	5	127	9	7	127	------	107	9	127	4	3	127	------	107	9	127	4	5
128	2	108	15	128	10	5	128	1	108	4	128	4	2	128	1	108	6	128	------	------
129	7	109	8	129	6	3	129	2	109	5	129	2	1	129	------	109	5	129	------	------
130	3	110	9	130	7	8	130	------	110	3	130	1	------	130	------	110	3	130	1	------
131	------	111	11	131	4	4	131	1	111	4	131	1	------	131	1	111	5	131	2	1
132	2	112	8	132	5	3	132	1	112	4	132	1	------	132	1	112	2	132	1	1
133	2	113	6	133	5	------	133	1	113	2	133	1	1	133	------	113	2	133	1	1
134	------	114	4	134	1	2	134	------	114	------	134	1	------	134	1	114	------	134	1	------
135	------	115	2	135	4	3	135	------	115	1	135	------	------	135	1	115	1	135	------	------
136	3	116	2	136	2	2	136	------	116	------	136	------	------	136	------	116	2	136	------	3
137	------	117	4	137	2	2	137	------	117	------	137	1	------	137	------	117	------	------	------	------
138	2	118	1	138	2	2	138	------	118	2	138	------	2	138	------	118	------	------	------	------
139	------	119	3	139	2	1	139	------	119	------	139	1	------	139	------	119	1	------	------	------

See footnotes at end of table.

Table 36.—*Frequency distributions of 10,042 women by age and by 59 measurements*—Continued

Women not wearing foundation garments							Women wearing foundation garments														
							Skin measurements							Measurements over foundation garments							
Centimeters	Number of women of given bust girth	Centimeters	Number of women of given waist girth	Centimeters	Number of women of given abdominal-extension girth	Number of women of given hip girth	Centime ers	Number of women of given bust girth	Centimeters	Number of women of given waist girth	Centimeters	Number of women of given abdominal-extension girth	Number of women of given hip girth	Centimeters	Number of women of given bust girth	Centimeters	Number of women of given waist girth	Centimeters	Number of women of given abdominal-extension girth	Number of women of given hip girth
140		120	2	140	1	2	140		120	2	140			140		120	1			
141		121	1	141	2		141		121		141			141		121				
142		122	2	142			142		122		142			142		122				
143		123		143		1	143		123		143			143		123				
144		124	1	144	1		144		124		144	2		144		124				
145		125		145	1		145		125	1				145	1	125				
146	1	126		146			146		126							126	1			
147		127		147			147		127	1										
148		128		148			148													
149		129	(2)	149	(3)	(4)	149	1												

[1] 27 weights are not shown, namely, 68, 72, 73, 73, 241, 244, 245, 245, 246, 246, 246, 249, 250, 252, 252, 253, 253, 254, 255, 257, 260, 260, 261, 262, 278, 280, and 290.
[2] 2 waist girths are not shown, namely, 133 and 137.
[3] 4 abdominal-extension girths are not shown, namely, 59, 64, 150, and 154.
[4] 1 hip girth is not shown, namely, 157.
[5] 5 sitting-spread girths are not shown, namely, 152, 152, 153, 153, and 153.

Table 37.—*Bivariate distribution of 10,042 women by age and weight*

Weight (pounds)	Women in indicated age classes (years)													
	18 and 19	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59	60–64	65–69	70–74	75 and over	All ages
Under 85	1	4	5	4	2	4	1		2	1				24
85–89	2	11	5	8	1	4	2	3	3	2				41
90–94	17	23	24	16	15	2	4	4	4	8		1	2	120
95–99	26	69	53	26	17	8	11	10	12	3			1	236
100–104	57	103	87	65	38	38	20	14	9	6	6	2	2	447
105–109	85	154	128	93	74	38	33	19	12	9	5	1	3	654
110–114	97	219	176	112	102	58	36	25	22	18	6	1		872
115–119	108	215	142	151	96	67	32	23	27	18	3	2	2	886
120–124	108	195	172	148	143	87	52	36	29	25	9	1	2	1,007
125–129	72	164	134	128	93	100	73	44	25	18	8	2	2	863
130–134	66	140	104	125	118	85	86	51	31	17	8	4	1	836
135–139	42	111	85	81	105	95	64	42	49	32	10	1	1	718
140–144	28	66	63	77	83	79	67	45	36	25	12	3	3	587
145–149	29	56	49	47	52	63	81	42	32	13	3	5	3	475
150–154	21	31	27	36	51	66	61	40	26	19	9	2	1	390
155–159	11	30	19	35	52	58	63	39	36	19	4	3		369
160–164	7	19	25	31	30	46	42	48	33	19	6			306
165–169	3	15	17	15	33	33	40	40	21	11	4	1		233
170–174	5	8	8	12	15	40	30	27	25	11	3	1		185
175–179	3	7	8	19	15	24	21	22	16	9	4	1		149
180–184	3	7	9	15	19	28	25	22	23	10	4			165
185–189		2	6	10	20	14	22	23	10	6	4	2		119
190–194			5	5	9	20	15	16	8	6			1	85
195–199	1	3	3	4	7	8	13	6	9	3	1			58
200–204	1	2	3	5	8	7	6	8	3	3	2	1		49
205–209		1	4	2	3	4	8	7	5		1	2		37
210–214		1	1	6	5	10	8	3	2	1				37
215–219		2	4	3	2	4	4	3	1	1	1			25
220–229		1		3	3	2	8	7	4	3	1			32
230 and over		2	2	3	4	7	5	10	2	1	1			37
All weights	793	1,661	1,368	1,285	1,215	1,099	933	679	517	317	115	36	24	10,042

Table 38.—*Bivariate distribution of 10,042 women by age and stature*

Stature (inches)	Women in indicated age classes (years)													
	18 and 19	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59	60–64	65–69	70–74	75 and over	All ages
Under 56			4	4	1	4	4	3	3	5			1	29
56	1	6	8	6	7	7	5	4	11	3			1	59
57	5	16	14	15	14	12	14	14	6	10	5		2	127
58	9	25	29	23	33	26	32	19	26	19	4	2	1	248
59	28	66	71	60	65	64	54	57	30	33	12	6	4	550
60	52	117	111	101	110	91	82	65	65	43	14	4	2	857
61	83	185	146	146	144	154	121	108	75	54	25	9	5	1,255
62	112	260	208	216	202	168	160	119	95	45	16	3	2	1,606
63	147	261	223	210	204	192	177	109	72	42	15	5	4	1,661
64	117	270	221	194	182	157	121	86	49	29	11	4	1	1,442
65	103	183	143	135	111	96	84	46	38	19	10	3	1	972
66	63	143	94	87	73	65	47	28	28	10	2			640
67	41	68	52	53	38	38	15	16	14	2				337
68	18	36	24	20	19	14	13	3	3	3				153
69	7	21	12	11	9	9	2	2	1		1			75
70 and over	7	4	8	4	3	2	2		1					31
All statures	793	1,661	1,368	1,285	1,215	1,099	933	679	517	317	115	36	24	10,042

Table 39.—*Bivariate distribution of 10,042 women by age and bust girth*

Bust girth (inches)	Women in indicated age classes (years)													
	18 and 19	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59	60–64	65–69	70–74	75 and over	All ages
Under 29	3	6	11	9	4	5	2	6	3	4				53
29	19	42	30	30	17	7	13	7	10	4	2	1	2	184
30	35	104	69	54	35	31	21	18	15	10	1	1	1	395
31	127	204	162	117	93	54	26	21	15	15	8	1	1	844
32	141	299	223	187	128	87	50	34	27	20	3		5	1,204
33	167	303	247	198	169	95	78	33	37	19	9	2	2	1,359
34	106	258	229	202	150	110	101	54	31	26	7	5	2	1,281
35	82	173	124	134	138	127	99	54	35	19	16	4	1	1,006
36	44	117	93	88	107	105	72	48	42	32	10	1	4	763
37	30	54	67	79	95	106	89	77	57	29	14	3	2	702
38	14	37	28	52	73	86	67	45	37	27	5		2	473
39	6	23	25	29	50	75	64	49	48	23	9	5		406
40	12	11	14	31	48	50	53	40	33	21	10	4		327
41	3	8	8	26	26	54	64	46	30	18	5	2	1	291
42	1	7	16	15	29	25	36	34	31	17	4	2		211
43	2	5	7	7	16	21	27	32	24	11	5	1		158
44		2	9	8	9	18	26	34	17	8	2	1		134
45	1	5	4	8	8	14	13	11	7	3	2	3	1	80
46		1	3	4	6	10	9	14	6	3	1			57
47			2		5	8	10	3	5	1				34
48 and 49		1	2	5	4	7	7	10	6	5	2			49
50 and over		1	1	2	5	4	6	9	1	2				31
All bust girths	793	1,661	1,368	1,285	1,215	1,099	933	679	517	317	115	36	24	10,042

Table 40.—*Bivariate distribution of 10,042 women by age and hip girth*

Hip girth (inches)	Women in indicated age classes (years)													
	18 and 19	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59	60–64	65–69	70–74	75 and over	All ages
Under 32	4	15	5	7	2	4	1	3	2	1				44
32	17	25	20	10	11	4	5	3	2	2		1		100
33	26	58	45	30	18	11	11	6	9	6	1		3	224
34	79	156	108	82	62	46	22	18	13	18	7	1	1	613
35	113	235	204	125	84	62	44	29	23	19	2		3	943
36	155	282	207	179	138	79	59	45	32	24	17	5	1	1,223
37	154	291	236	209	174	129	79	66	47	26	8	5	1	1,425
38	91	235	161	173	168	152	128	67	68	43	11	1	2	1,300
39	61	143	136	152	166	141	104	86	47	38	14	6	4	1,098
40	47	79	79	102	126	117	123	75	66	31	11	5	5	866
41	21	57	53	68	67	97	105	61	56	24	14	2	2	627
42	11	32	28	46	61	85	74	51	49	24	9	2		472
43	5	18	37	33	38	61	57	52	31	20	7	1	1	361
44	5	10	18	25	32	32	37	36	29	15	7	3	1	250
45	1	10	12	15	19	33	27	26	12	9	2	3		169
46	1	5	7	11	17	16	20	15	11	10	1			114
47		3	2	4	13	8	19	11	8	5				73
48	2	3	2	5	7	11	7	6	2	1	1	1		48
49		2	4	4	6	3	3	9	3	4	1			39
50 and 51		1	2	2	5	5	4	10		1	1			31
52 and over		1	2	3	1	3	4	4	2	1	1			22
All hip girths	793	1,661	1,368	1,285	1,215	1,099	933	679	517	317	115	36	24	10,042

Table 41.—*Bivariate distribution of 10,042 women by stature and hip girth*

Hip girth (inches)	Women in indicated stature classes (inches)																
	Under 56	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70 and over	All statures
Under 32	1	2	2	3	6	6	6	7	5	3	2	1					44
32		4	6	7	14	11	17	15	13	8	4				1		100
33	2	1	10	13	23	27	38	38	33	24	12	3					224
34	2	7	12	33	45	77	96	116	90	66	31	25	5	7	1		613
35	3	7	17	12	69	96	136	172	169	112	87	37	17	6	2	1	943
36	2	8	14	34	71	103	141	212	208	203	111	68	33	7	3	5	1,223
37	2	7	15	41	68	101	178	196	231	231	152	99	61	22	16	5	1,425
38	3	6	14	22	48	104	168	199	222	185	135	100	47	33	11	3	1,300
39	2	4	11	22	56	85	116	175	177	173	116	84	49	18	9	1	1,098
40	5	2	6	17	44	59	99	121	146	123	97	78	39	15	13	2	866
41	1	2	8	11	33	47	65	93	119	78	68	54	29	13	4	2	627
42	2	5	5	12	22	34	58	73	78	68	48	29	21	13	3	1	472
43	3	1	3	9	16	31	37	82	42	41	39	26	13	10	5	3	361
44		2		6	9	30	29	39	38	45	22	14	10	3	2	1	250
45	1	1	1	1	8	16	21	23	26	27	23	8	4	2	3	4	169
46			1	1	6	13	19	11	28	18	6	5	2	3		1	114
47				1	4	5	9	14	12	17	7	1	2		1		73
48			1	1	1	3	5	11	6	6	5	5	1	1		2	48
49			1	1	3	5	7	2	7	6	2	2	2		1		39
50 and 51				1	4	3	5	4	5	4	3		2				31
52 and over						1	5	3	6	4	2	1					22
All hip girths	29	59	127	248	550	857	1,255	1,606	1,661	1,442	972	640	337	153	75	31	10,042

Table 42.—*Bivariate distribution of 10,042 women by stature and weight*

Weight (pounds)	Women in indicated stature classes (inches)																
	Under 56	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70 and over	All statures
Under 85	1	4	5	3	3	2	3	2	1								24
85–89	1	4	5	4	7	5	9	3	3								41
90–94			9	12	19	22	27	13	12	5	1						120
95–99	2	6	10	17	38	37	43	41	27	11	2	1		1			236
100–104	2	6	12	21	47	69	84	87	56	40	17	4	1		1		447
105–109	3	5	12	30	59	88	102	119	114	68	34	14	3	2	1		654
110–114	1	5	14	25	49	78	123	196	157	121	58	34	5	5	1		872
115–119	2	4	9	21	45	70	118	128	170	154	96	42	19	7	1		886
120–124	2	5	15	16	45	74	114	175	175	160	118	63	33	7	3	2	1,007
125–129	4	3	5	10	37	59	101	123	141	158	102	65	32	14	6	3	863
130–134	3	4	7	16	21	55	89	132	123	153	95	73	36	19	5	5	836
135–139	1	4	3	15	28	47	81	103	128	101	69	66	39	15	17	1	718
140–144	1		3	11	39	42	49	77	99	74	71	59	44	13	5		587
145–149		3	4	9	27	26	55	57	71	67	60	45	25	16	6	4	475
150–154	4		3	8	18	32	49	49	68	50	41	32	23	6	6	1	390
155–159	1	4	5	4	13	31	34	61	52	52	41	35	16	13	4	3	369
160–164			1	8	14	30	28	54	53	35	36	22	11	8	5	1	306
165–169		2	1	5	7	23	24	32	42	33	25	18	10	7	4		233
170–174				5	6	11	24	32	31	31	19	13	8	4	1		185
175–179			1		4	9	20	26	24	21	16	12	7	4	1	4	149
180–184			2	1	8	12	19	27	26	23	20	11	7	4	4	1	165
185–189				2	5	12	19	19	20	17	11	8	3	3			119
190–194	1			1	2	8	9	13	13	16	10	5	3	1		3	85
195–199			1	1	4	3	5	11	11	8	8	2	3		1		58
200–204				2	1	3	6	7	10	7	5	4	2		1	1	49
205–209					1		5	7	3	11	5	2	1	1		1	37
210–214				1		4	3	4	10	11	2	2					37
215–219					2	1	3	2	6	2	3	3	1	1		1	25
220–229						2	5	2	6	7	3	2	3	2			32
230 and over					1	2	4	4	9	6	4	3	2		2		37
All weights	29	59	127	248	550	857	1,255	1,606	1,661	1,442	972	640	337	153	75	31	10,042

Table 43.—*Bivariate distribution of 10,042 women by bust girth and weight*

Weight (pounds)	Women in indicated bust-girth classes (inches)																					
	Under 29	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48 and 49	50 and over	All bust girths
Under 85	9	8	5	2																			24
85–89	15	14	8	3	1																		41
90–94	15	34	35	28	5	2	1																120
95–99	6	37	61	77	44	11																	236
100–104	5	39	86	152	111	47	4	3															447
105–109	1	27	89	178	188	123	36	8	2	2													654
110–114		16	65	160	269	196	113	42	6	4		1											872
115–119	2	6	30	125	221	250	150	73	16	8	3	2											886
120–124		2	9	72	188	284	238	140	46	20	5	3											1,007
125–129		1	4	29	93	198	247	153	83	37	15	1	2										863
130–134			3	10	47	130	214	170	134	74	33	7	9	4	1								836
135–139				5	22	64	133	158	137	109	52	20	13	3	1		1						718
140–144				2	10	26	79	129	115	105	54	40	19	6	2								587
145–149					2	20	38	76	88	102	70	38	24	5	7	3	2						475
150–154					2	5	20	31	43	89	61	64	38	23	7	2	4		1				390
155–159						2	5	18	54	57	53	70	55	28	20	6			1				369
160–164						1	2	4	26	46	52	59	39	42	24	7	3		1				306
165–169							1	1	6	29	33	31	41	41	26	15	5	3	1				233
170–174									5	8	17	22	35	36	16	22	17	5	1	1			185
175–179				1	1				1	9	13	19	21	23	27	20	10	3			1		149
180–184									1	3	10	12	16	33	25	25	25	7	5	1	1	1	165
185–189											1	12	9	22	17	20	15	11	8	1	3		119
190–194												3	3	12	13	16	19	7	3	5	4		85
195–199												1	2	4	8	6	12	10	6	3	4	2	58
200–204											1	1	1	3	8	4	9	8	8	5	1		49
205–209														3	7	2	4	9	2	4	3	3	37
210–214														1	1	6	4	11	4	3	6	1	37
215–219															1	3	1	3	7	4	6		25
220–229														2		1	3	2	6	6	6	6	32
230 and over																		1	3	1	14	18	37
All weights	53	184	395	844	1,204	1,359	1,281	1,006	763	702	473	406	327	291	211	158	134	80	57	34	49	31	10,042

Table 44.—*Bivariate distribution of 10,042 women by hip girth and weight*

Weight (pounds)	Women in indicated hip-girth classes (inches)																					
	Under 32	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50 and 51	52 and over	All hip girths
Under 85	11	9	4																			24
85–89	9	16	10	6																		41
90–94	12	27	49	27	5																	120
95–99	4	27	74	89	33	7	2															236
100–104		9	59	189	134	48	6	1	1													447
105–109	2	7	17	157	251	159	52	9														654
110–114			6	101	277	290	135	56	5	2												872
115–119	1	2	1	27	163	314	279	83	13	3												886
120–124	1	3	4	7	55	234	398	232	62	9	2											1,007
125–129	4			3	12	104	260	274	148	50	5	2	1									863
130–134				3	11	39	162	286	228	79	22	5	1									836
135–139				2	1	18	83	188	218	146	44	17	1									718
140–144				1	1	6	27	85	192	163	81	23	7	1								587
145–149				1		1	13	48	113	131	109	39	18	1	1							475
150–154						1	6	18	63	108	102	62	16	11	3							390
155–159						2		13	35	77	94	72	52	17	6	1						369
160–164								5	10	49	66	87	46	33	5	4	1					306
165–169							1	1	6	22	46	56	61	30	5	5						233
170–174									4	14	29	39	48	34	12	4	1					185
175–179							1	1		9	11	24	36	32	25	3	5	2				149
180–184										2	7	26	26	41	28	20	9	2	3	1		165
185–189										1	5	10	23	24	24	18	9	4		1		119
190–194											2	4	14	9	17	21	7	6	4		1	85
195–199										1	1	3	5	9	14	8	8	5	3	1		58
200–204											1	2	3	4	9	8	9	7	5	1		49
205–209												1	1		11	9	5	6	1	3		37
210–214													1		4	9	7	5	6	3	2	37
215–219														1	3	1	6	5	4	4	1	25
220–229														1	3	2	3	3	4	7	6	3	32
230 and over																		3	2	6	11	15	37
All weights	44	100	224	613	943	1,223	1,425	1,300	1,098	866	627	472	361	250	169	114	73	48	39	31	22	10,042

Table 45.—*Means of 55 measurements of 10.042 women by 5-year age groups*

Measurement	18 and 19	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59	60–64	65–69	70–74	75 and over
	Pounds	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*
Weight	121.79	123.01	124.68	129.51	134.46	141.61	145.93	149.62	146.30	142.65	144.69	145.03	125.92
Vertical measurements:	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*
Stature	63.79	63.60	63.36	63.36	63.13	63.11	62.87	62.60	62.45	61.91	62.08	61.92	61.02
Cervicale height	54.70	54.57	54.37	54.70	54.30	54.38	54.25	54.00	53.95	53.47	53.74	53.56	54.64
Bust height	46.09	45.80	45.43	45.26	44.97	44.79	44.50	44.11	43.98	43.45	43.75	43.69	43.07
Waist height	40.51	40.29	40.00	40.07	39.97	40.02	39.96	39.81	39.77	39.47	39.70	39.89	39.30
Abdominal-extension height	36.83	36.72	36.41	36.32	36.14	36.11	36.00	35.79	35.85	35.53	35.97	35.84	35.73
Hip height	32.13	32.02	31.72	31.67	31.52	31.46	31.36	31.23	31.15	30.99	31.09	31.32	31.05
Sitting-spread height	29.54	29.40	29.16	29.12	28.96	28.88	28.80	28.60	28.57	28.28	28.52	28.84	28.54
Crotch height	29.24	29.04	28.70	28.63	28.42	28.32	28.16	28.05	27.98	27.67	27.69	27.87	27.62
Tibiale height	17.48	17.42	17.25	17.23	17.13	17.17	17.10	17.04	17.02	16.99	16.91	16.91	16.88
Ankle height	3.03	3.02	3.00	2.99	2.97	2.97	2.95	2.96	2.91	2.92	2.86	2.91	2.97
Total posterior arm length	23.06	23.07	22.95	22.96	22.97	23.03	23.02	23.03	22.95	22.82	23.11	22.91	22.83
Upper posterior arm length	13.27	13.29	13.26	13.26	13.27	13.29	13.31	13.29	13.24	13.20	13.40	13.01	13.15
Anterior arm length	16.85	16.88	16.71	16.65	16.54	16.52	16.40	16.39	16.29	16.23	16.27	16.22	16.55
Sitting height	24.62	24.57	24.57	24.57	24.67	24.78	24.72	24.55	24.53	24.18	24.44	24.04	23.60
Vertical trunk girth	58.30	58.55	59.00	59.60	60.37	61.31	61.68	61.95	61.86	61.34	61.69	61.78	59.36
Cervicale to waist anterior	18.86	18.98	19.06	19.13	19.17	19.32	19.27	19.27	19.07	18.79	18.75	18.68	18.24
Anterior waist length	12.74	12.84	12.91	12.91	12.94	13.04	12.98	12.96	12.82	12.58	12.59	12.26	12.05
Shoulder to waist	15.42	15.53	15.60	15.63	15.68	15.79	15.69	15.71	15.46	15.28	15.21	15.19	14.60
Neck to bust	10.16	10.38	10.56	10.84	11.15	11.51	11.68	11.93	11.86	11.83	11.79	11.89	11.53
Posterior waist length	14.69	14.83	14.92	14.98	15.04	15.12	15.11	15.05	15.05	15.01	15.03	14.81	14.53
Scye depth	7.37	7.41	7.49	7.65	7.83	8.00	8.13	8.20	8.23	8.22	8.38	7.96	7.94
Trunk line	7.86	7.90	7.90	7.75	7.67	7.56	7.34	7.23	7.16	7.04	6.99	6.95	6.98
Arm length, shoulder to scye	5.21	5.27	5.30	5.47	5.55	5.61	5.69	5.68	5.72	5.63	5.77	5.72	5.82
Waist to hip	8.96	8.85	8.89	9.00	9.06	9.16	9.21	9.19	9.24	9.05	9.12	9.16	8.82
Total crotch length	28.43	28.41	28.69	29.20	29.84	30.52	31.00	31.28	31.25	30.96	31.19	31.32	29.43
Anterior crotch length	13.84	13.81	14.01	14.28	14.61	14.97	15.23	15.46	15.34	14.97	15.38	15.53	14.30
Horizontal measurements:													
Chest girth at armscye	33.09	33.29	33.58	34.24	35.01	35.92	36.42	36.91	36.59	36.11	36.07	36.16	33.69
Bust girth	33.74	33.91	34.22	34.85	35.77	36.83	37.57	38.34	37.94	37.54	37.56	38.17	34.92
Waist girth	26.00	26.40	27.27	28.32	29.47	30.77	31.75	32.90	32.80	32.59	32.93	33.39	30.82
Abdominal-extension girth	32.88	33.37	34.10	35.33	36.55	37.88	39.04	40.18	39.99	39.87	39.88	40.36	37.89
Hip girth	37.22	37.44	37.82	38.46	39.11	39.83	40.33	40.67	40.20	40.10	40.11	40.18	38.51
Sitting-spread girth	36.63	36.89	37.30	38.08	38.82	39.75	40.50	41.11	40.75	40.50	40.89	41.01	38.81
Maximum thigh girth	21.48	21.56	21.70	22.09	22.44	22.89	23.13	23.17	22.72	22.42	22.51	22.05	21.22
Midway thigh girth	19.03	19.13	19.19	19.41	19.66	20.06	20.21	20.24	19.89	19.64	19.54	19.17	18.35
Bent knee girth	14.12	14.00	13.92	14.09	14.22	14.57	14.72	14.87	14.70	14.70	14.71	14.90	13.97
Knee girth at tibiale	13.66	13.67	13.63	13.77	13.90	14.21	14.38	14.53	14.38	14.41	14.43	14.65	13.73
Maximum calf girth	13.43	13.30	13.18	13.29	13.38	13.63	13.74	13.83	13.66	13.60	13.60	13.48	12.68
Minimum leg girth	8.23	8.22	8.21	8.25	8.28	8.39	8.41	8.47	8.44	8.38	8.48	8.52	8.10
Ankle girth	9.23	9.21	9.21	9.24	9.29	9.37	9.42	9.48	9.52	9.43	9.48	9.67	9.05
Neck-base girth	14.98	15.05	14.91	15.19	15.32	15.48	15.51	15.63	15.55	15.43	15.46	15.77	15.24
Armscye girth	15.13	15.26	15.51	15.93	16.28	16.69	16.90	17.16	16.99	16.77	17.12	17.03	15.97
Upper arm girth	10.59	10.67	10.85	11.14	11.48	11.94	12.12	12.38	12.18	11.94	12.06	11.89	10.89
Elbow girth	10.03	10.07	10.14	10.29	10.36	10.61	10.67	10.76	10.61	10.55	10.56	10.63	9.68
Forearm girth	9.46	9.45	9.54	9.68	9.80	10.02	10.08	10.15	10.00	9.81	9.86	9.91	9.15
Wrist girth	5.91	5.88	5.90	5.96	6.01	6.09	6.15	6.20	6.20	6.16	6.18	6.21	5.95
Shoulder length	4.63	4.62	4.58	4.60	4.63	4.68	4.67	4.70	4.68	4.67	4.64	4.77	4.56
Anterior chest width	12.24	12.27	12.27	12.38	12.52	12.72	12.73	12.83	12.62	12.53	12.46	12.64	12.02
Highest bust-level width	7.16	7.18	7.17	7.25	7.38	7.52	7.58	7.69	7.65	7.53	7.56	7.71	7.26
Posterior chest width	12.94	13.01	13.16	13.29	13.46	13.61	13.78	13.84	13.88	13.70	13.57	13.89	13.43
Anterior bust arc	18.91	19.02	19.16	19.58	20.18	20.91	21.29	21.85	21.46	21.19	21.09	21.38	19.45
Anterior waist arc	14.50	14.78	15.31	15.90	16.68	17.58	18.24	19.06	18.93	18.62	18.89	18.95	17.32
Abdominal-extension arc	17.85	18.08	18.43	19.09	19.86	20.62	21.28	21.98	21.96	21.72	21.80	21.70	20.31
Posterior hip arc	18.41	18.55	18.73	19.03	19.26	19.64	19.92	19.94	19.73	19.72	19.73	19.80	19.24
Angle:	*Degrees*	*Degrees*	*Degrees*	*Degrees*	*Degrees*	*Degrees*	*Degrees*	*Degrees*	*Degrees*	*Degrees*	*Degrees*	*Degrees*	*Degrees*
Shoulder slope	23.54	23.57	23.61	23.53	23.27	23.55	23.36	23.68	23.73	23.52	24.10	24.92	22.58

Table 46.—*Partial correlations among 19 girth measurements and weight of 4,128 women, with age and the square of age constant*

Measurement	Chest girth at armscye	Bust girth	Waist girth	Abdominal-extension girth	Hip girth	Sitting-spread girth	Maximum thigh girth	Midway thigh girth	Bent knee girth	Knee girth at tibiale	Maximum calf girth	Minimum leg girth	Ankle girth	Neck-base girth	Armscye girth	Upper-arm girth	Elbow girth	Forearm girth	Wrist girth
Weight	.8704	.8767	.8676	.8949	.9072	.8924	.8747	.8335	.7646	.7512	.7747	.6025	.5344	.6681	.7979	.8550	.7227	.8118	.6132
Chest girth at armscye		.9215	.8619	.8249	.7581	.7468	.7288	.6870	.5991	.5850	.6150	.4528	.4163	.6578	.7692	.8376	.6688	.7517	.5383
Bust girth			.8962	.8540	.7653	.7575	.7292	.6872	.5910	.5807	.6137	.4468	.3996	.6295	.7682	.8366	.6465	.7313	.5127
Waist girth				.8978	.7827	.7759	.7231	.6845	.6044	.5979	.6069	.4730	.4216	.6239	.7332	.8223	.6273	.6976	.5200
Abdominal-extension girth					.8593	.8557	.8011	.7529	.6477	.6433	.6387	.4820	.4242	.5840	.7316	.8238	.6273	.7047	.5057
Hip girth						.9340	.9092	.8439	.7354	.7314	.7355	.5726	.4802	.5441	.7026	.7974	.6490	.7335	.5233
Sitting-spread girth							.9012	.8470	.7292	.7223	.7340	.5550	.4530	.5339	.6922	.7806	.6225	.7119	.4880
Maximum thigh girth								.9074	.7252	.7368	.7521	.5579	.4388	.5072	.6890	.7991	.6338	.7373	.4773
Midway thigh girth									.7330	.7469	.7702	.5739	.4488	.4933	.6391	.7615	.6094	.7173	.4800
Bent knee girth										.8445	.7636	.6593	.5686	.4596	.5826	.6309	.5896	.6513	.5651
Knee girth at tibiale											.7525	.6583	.5420	.4583	.5775	.6337	.5857	.6541	.5447
Maximum calf girth												.7192	.5536	.4662	.5771	.6451	.5871	.6902	.5272
Minimum leg girth													.6871	.3707	.4408	.4710	.4957	.5593	.5960
Ankle girth														.3527	.4315	.3800	.4692	.4794	.5915
Neck-base girth															.5877	.5956	.5304	.5868	.4583
Armscye girth																.7933	.6702	.7251	.5484
Upper-arm girth																	.6979	.8002	.5254
Elbow girth																		.8249	.5849
Forearm girth																			.6201

Table 47.—*Means of weight, age, stature, and 20 girth measurements of 10,042 women, by weight group*

Weight (pounds)	Weight	Age	Stature	Vertical trunk girth	Chest girth at armseye	Bust girth	Waist girth	Abdominal-extension girth	Hip girth	Sitting-spread girth	Maximum thigh girth	Midway thigh girth
	Pounds	*Years*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*
Under 85	80.29	35.67	59.04	53.69	28.97	29.15	23.00	28.72	31.95	31.10	17.01	15.25
85–89	86.83	35.16	59.85	53.92	29.43	29.36	23.59	29.45	32.82	32.03	17.74	15.72
90–94	92.14	33.53	60.81	54.87	30.20	30.36	24.15	30.00	33.39	32.54	18.33	16.16
95–99	97.13	30.95	61.08	55.64	30.83	31.14	24.60	30.63	34.15	33.39	18.89	16.70
100–104	102.16	31.71	61.73	56.29	31.37	31.62	25.01	31.39	34.91	34.29	19.55	17.33
105–109	107.02	31.18	62.12	56.94	31.86	32.20	25.39	31.89	35.61	34.92	20.06	17.72
110–114	111.90	31.30	62.65	57.58	32.33	32.80	25.90	32.61	36.26	35.68	20.52	18.19
115–119	116.87	31.56	63.09	58.18	32.90	33.29	26.38	33.20	36.80	36.30	20.99	18.48
120–124	121.85	33.15	63.26	58.89	33.39	33.92	27.11	34.09	37.51	37.10	21.51	18.96
125–129	126.85	34.51	63.54	59.45	33.92	34.53	27.75	34.89	38.19	37.87	21.93	19.31
130–134	131.85	35.65	63.66	59.99	34.59	35.32	28.54	35.82	38.74	38.44	22.32	19.62
135–139	136.83	37.72	63.68	60.69	35.18	35.98	29.38	36.72	39.35	39.19	22.71	19.94
140–144	141.78	39.30	63.73	61.13	35.76	36.61	30.32	37.54	39.96	39.81	23.11	20.32
145–149	146.78	39.46	63.79	61.63	36.24	37.23	30.88	38.34	40.50	40.47	23.49	20.59
150–154	151.78	41.66	63.48	62.23	37.02	38.26	32.05	39.41	41.08	41.27	23.84	20.81
155–159	156.87	42.55	63.64	62.73	37.41	38.88	32.93	40.39	41.64	41.95	24.01	21.00
160–164	161.78	43.70	63.52	63.23	37.99	39.52	33.72	41.36	42.28	42.56	24.43	21.35
165–169	166.73	43.97	63.58	63.90	38.70	40.30	34.47	41.99	42.71	43.01	24.74	21.72
170–174	171.63	45.28	63.58	64.45	39.30	41.24	35.47	42.85	43.11	43.52	24.99	21.81
175–179	176.89	44.23	63.88	64.94	39.52	41.31	35.86	43.44	43.72	44.47	25.33	22.31
180–184	181.71	44.83	63.64	65.46	40.24	42.37	36.94	44.39	44.63	45.43	25.97	22.77
185–189	186.56	46.26	63.28	65.96	40.70	43.01	37.68	45.38	44.95	45.79	25.94	22.68
190–194	191.66	46.43	63.63	66.60	41.12	43.76	38.58	46.01	45.75	46.45	26.33	23.06
195–199	196.71	44.91	63.30	66.64	42.05	44.81	39.97	46.53	45.81	46.38	26.28	23.24
200–204	201.78	44.40	63.70	67.80	42.26	44.54	39.46	46.68	46.59	47.88	27.10	23.33
205–209	206.81	46.18	64.07	68.06	42.51	45.38	40.48	48.13	46.87	48.49	27.07	23.85
210–214	211.19	42.47	63.39	68.44	43.03	45.89	41.57	48.87	48.02	48.52	27.65	23.81
215–219	216.68	41.42	64.11	68.35	42.76	46.49	40.70	49.14	48.43	49.45	28.18	24.70
220–229	224.59	48.34	64.22	69.87	43.57	47.53	42.75	49.92	48.55	50.80	28.24	24.76
230 and over	247.27	44.39	64.06	72.03	46.15	50.62	45.35	52.90	51.92	53.01	29.22	25.74

Weight (pounds)	Bent knee girth	Knee girth at tibiale	Maximum calf girth	Minimum leg girth	Ankle girth	Neck-base girth	Armseye girth	Upper-arm girth	Elbow girth	Forearm girth	Waist girth
	Inches	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*
Under 85	11.64	11.58	10.89	7.08	8.25	13.60	13.32	8.59	8.82	7.95	5.38
85–89	12.36	11.85	11.33	7.25	8.36	13.86	13.65	8.92	8.93	8.13	5.42
90–94	12.42	12.25	11.65	7.47	8.57	14.20	13.86	9.12	9.19	8.44	5.56
95–99	12.63	12.39	11.89	7.56	8.66	14.23	14.22	9.52	9.32	8.61	5.61
100–104	12.88	12.67	12.21	7.71	8.75	14.51	14.55	9.78	9.46	8.81	5.68
105–109	13.13	12.88	12.44	7.83	8.88	14.61	14.80	10.03	9.63	8.98	5.73
110–114	13.45	13.20	12.71	7.95	8.97	14.79	14.96	10.27	9.78	9.18	5.79
115–119	13.64	13.33	12.93	8.07	9.12	14.93	15.22	10.47	9.93	9.29	5.86
120–124	13.86	13.57	13.09	8.13	9.18	15.01	15.50	10.75	10.09	9.46	5.91
125–129	14.07	13.79	13.26	8.26	9.29	15.10	15.77	10.99	10.22	9.60	5.97
130–134	14.28	13.97	13.45	8.31	9.30	15.25	16.05	11.32	10.34	9.76	6.01
135–139	14.49	14.14	13.60	8.39	9.40	15.34	16.30	11.57	10.46	9.88	6.05
140–144	14.67	14.30	13.76	8.47	9.44	15.50	16.60	11.82	10.58	10.02	6.13
145–149	14.83	14.47	13.97	8.54	9.51	15.57	16.81	12.11	10.74	10.12	6.15
150–154	14.99	14.60	14.11	8.56	9.57	15.70	17.12	12.42	10.84	10.30	6.18
155–159	15.25	14.87	14.27	8.68	9.64	15.83	17.43	12.61	10.98	10.42	6.26
160–164	15.49	15.02	14.42	8.71	9.67	15.92	17.52	12.89	11.05	10.50	6.29
165–169	15.59	15.26	14.62	8.79	9.74	16.06	17.75	13.17	11.12	10.67	6.32
170–174	15.77	15.16	14.69	8.89	9.87	16.28	18.16	13.42	11.37	10.82	6.38
175–179	16.12	15.67	14.97	9.03	9.98	16.34	18.17	13.58	11.35	10.91	6.44
180–184	16.22	15.72	15.13	9.04	9.93	16.45	18.44	13.87	11.58	10.97	6.45
185–189	16.20	15.74	15.11	9.14	10.05	16.55	18.80	14.13	11.67	11.11	6.57
190–194	16.60	16.01	15.43	9.18	10.07	16.75	18.94	14.27	11.72	11.26	6.58
195–199	16.87	16.17	15.87	9.31	10.10	16.93	19.10	14.62	11.95	11.42	6.58
200–204	17.48	16.74	15.84	9.42	10.33	17.05	19.41	14.70	12.24	11.68	6.70
205–209	17.29	16.76	15.80	9.41	10.38	17.02	19.59	14.99	12.29	11.66	6.67
210–214	17.54	16.91	16.29	9.73	10.29	16.83	19.29	15.00	12.19	11.58	6.73
215–219	17.75	17.01	16.78	9.74	10.46	17.06	19.61	15.17	12.15	11.72	6.73
220–229	18.66	17.77	17.02	9.91	10.73	17.51	20.08	15.54	12.62	11.93	6.88
230 and over	18.32	17.60	17.18	10.00	10.80	17.85	20.67	16.78	13.14	12.42	6.93

Table 48.—*Means of weight, stature, and 10 girth measurements of 10,042 women, by bust girth*

Bust girth (inches)	Weight	Stature	Vertical trunk girth	Chest girth at armscye	Waist girth	Abdominal-extension girth	Hip girth	Sitting-spread girth	Midway thigh girth	Neck-base girth	Armscye girth	Upper-arm girth
	Pounds	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*
Under 29	90.68	61.12	54.89	29.01	23.61	30.31	33.39	32.76	15.93	14.05	13.61	8.86
29	99.39	61.91	55.96	30.10	24.36	30.89	34.32	33.64	16.91	14.41	14.22	9.36
30	104.56	62.41	56.76	30.91	24.90	31.48	35.27	34.63	17.44	14.50	14.51	9.73
31	109.38	62.71	57.23	31.53	25.23	31.94	35.83	35.32	17.93	14.63	14.70	9.97
32	114.81	63.20	57.99	32.32	25.85	32.74	36.55	36.08	18.38	14.84	15.01	10.28
33	120.55	63.40	58.70	33.10	26.67	33.62	37.38	36.92	18.86	14.94	15.40	10.63
34	126.82	63.64	59.35	33.90	27.56	34.69	38.13	37.76	19.33	15.15	15.73	10.97
35	131.86	63.50	59.99	34.72	28.56	35.83	38.79	38.51	19.66	15.20	16.12	11.35
36	138.81	63.43	60.66	35.47	29.76	37.16	39.69	39.52	20.15	15.37	16.37	11.72
37	144.62	63.26	61.28	36.32	30.96	38.29	40.29	40.25	20.39	15.52	16.84	12.13
38	150.50	63.20	62.04	37.12	32.20	39.62	40.90	41.05	20.73	15.67	17.16	12.43
39	157.19	62.96	62.87	37.98	33.57	40.94	41.56	41.84	20.94	15.88	17.40	12.78
40	160.51	62.63	63.02	38.53	34.44	41.53	41.79	42.05	21.13	16.02	17.62	12.99
41	169.71	62.96	64.12	39.46	35.80	42.92	42.85	43.30	21.58	16.21	18.14	13.39
42	174.45	62.33	64.79	40.10	37.02	43.87	43.60	44.41	21.89	16.34	18.30	13.75
43	180.61	62.87	65.69	40.75	37.79	45.03	44.22	44.90	22.30	16.51	18.51	13.90
44	185.13	62.94	65.86	41.61	38.92	45.34	44.16	44.89	22.19	16.65	18.90	14.24
45	195.48	62.88	66.68	42.38	39.88	46.87	45.68	46.63	23.05	16.97	19.33	14.67
46	200.53	62.97	67.58	42.67	40.93	47.52	46.04	46.84	23.09	16.86	19.39	14.78
47	207.68	63.03	68.14	43.37	42.04	48.79	46.44	47.85	23.46	17.00	19.50	15.08
48 and 49	216.80	62.72	68.98	44.36	43.40	49.70	48.23	49.59	23.81	17.51	20.14	15.78
50 and over	234.13	62.92	71.11	46.34	46.02	52.35	49.95	51.82	25.02	17.92	20.31	16.31

Table 49.—*Means of weight, stature, and 10 girth measurements of 10,042 women, by hip girth*

Hip girth (inches)	Weight	Stature	Vertical trunk girth	Chest girth at armscye	Bust girth	Waist girth	Abdominal-extension girth	Sitting-spread girth	Midway thigh girth	Neck-base girth	Armscye girth	Upper-arm girth
	Pounds	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*
Under 32	92.52	61.23	54.98	30.28	30.59	24.08	29.71	31.88	15.62	14.16	13.97	9.11
32	94.63	61.35	55.17	30.36	30.65	24.09	29.86	32.18	16.37	14.26	13.91	9.16
33	98.11	61.81	55.71	30.86	31.05	24.39	30.35	32.89	16.63	14.41	14.31	9.39
34	104.90	62.26	56.71	31.77	32.03	25.26	31.43	34.05	17.37	14.61	14.68	9.84
35	110.42	62.73	57.38	32.20	32.54	25.64	32.16	35.03	17.84	14.76	14.93	10.15
36	116.49	63.04	58.14	32.94	33.44	26.43	33.14	36.00	18.39	14.92	15.21	10.46
37	123.04	63.38	58.97	33.55	34.13	27.29	34.22	37.12	18.96	15.07	15.58	10.83
38	129.60	63.42	59.86	34.37	35.05	28.45	35.58	38.17	19.44	15.18	15.94	11.21
39	137.23	63.41	60.60	35.26	36.05	29.63	36.90	39.36	20.00	15.34	16.33	11.59
40	145.04	63.53	61.52	36.03	37.10	30.85	38.21	40.49	20.45	15.52	16.76	12.04
41	152.82	63.46	62.28	37.03	38.27	32.22	39.65	41.56	20.87	15.72	17.12	12.47
42	160.75	63.30	63.12	37.87	39.24	33.66	41.15	42.75	21.46	15.94	17.56	12.87
43	168.39	63.34	63.96	38.54	40.13	34.43	42.28	43.91	22.01	16.05	17.83	13.24
44	174.56	63.26	64.40	39.24	41.03	35.53	43.42	44.91	22.24	16.13	18.10	13.48
45	185.12	63.49	65.79	40.33	42.50	37.05	44.81	46.06	23.08	16.49	18.51	13.99
46	190.43	63.08	66.13	40.85	43.48	38.44	46.60	47.47	23.52	16.51	18.73	14.21
47	198.16	63.23	67.03	41.55	44.23	39.11	47.37	48.45	23.98	16.71	19.22	14.62
48	203.92	63.71	67.36	41.71	44.10	39.24	47.87	48.91	24.58	16.69	19.10	14.74
49	211.74	62.88	68.52	42.89	46.19	41.26	49.51	50.22	24.37	16.87	19.13	15.10
50 and 51	223.23	62.66	70.09	43.66	47.34	42.95	50.81	51.99	24.66	17.41	20.01	15.73
52 and over	241.64	63.27	71.63	44.56	48.86	44.11	52.88	54.49	26.14	17.50	20.54	16.64

Table 50.—*Means of weight, bust girth, hip girth, and 10 vertical measurements of 10,042 women, by stature*

Stature (inches)	Weight	Bust girth	Hip girth	Cervicale height	Bust height	Waist height	Hip height	Crotch height	Tibiale height	Total posterior arm length	Anterior arm length	Sitting height	Total crotch length
	Pounds	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*
Under 56	124.69	36.91	38.64	47.50	38.03	34.37	26.75	23.68	14.85	20.45	14.24	22.28	28.24
56	116.86	35.11	37.52	48.44	39.44	35.16	27.70	24.54	15.23	20.78	14.54	22.58	28.20
57	117.20	34.88	37.52	49.46	40.51	36.11	28.46	25.28	15.51	21.11	14.95	22.80	28.20
58	123.47	35.55	37.97	50.22	41.24	36.80	28.91	25.83	15.75	21.38	15.18	23.19	28.89
59	125.55	35.55	38.24	51.18	42.11	37.48	29.47	26.42	16.11	21.62	15.54	23.42	28.95
60	129.15	35.77	38.57	52.02	42.89	38.16	29.99	26.95	16.40	22.08	15.80	23.78	29.27
61	130.47	35.73	38.62	52.89	43.70	38.86	30.63	27.55	16.70	22.42	16.09	24.11	29.48
62	131.93	35.57	38.69	53.74	44.52	39.58	31.23	28.15	17.01	22.78	16.45	24.37	29.51
63	134.51	35.61	38.85	54.63	44.89	40.29	31.80	28.71	17.31	23.12	16.72	24.74	29.77
64	136.07	35.56	38.99	55.47	46.15	40.97	32.38	29.31	17.60	23.42	16.98	25.01	29.82
65	138.25	35.53	39.10	56.36	47.03	41.73	33.00	29.94	17.95	23.80	17.32	25.30	30.03
66	140.57	35.63	39.21	57.22	47.70	42.40	33.63	30.48	18.28	24.14	17.57	25.62	30.21
67	143.58	35.65	39.52	58.10	48.60	43.09	34.16	31.48	18.51	24.51	17.48	26.00	30.43
68	145.44	35.56	39.63	59.11	49.55	43.88	34.85	31.87	18.93	24.85	18.18	26.32	30.77
69	148.47	35.75	39.82	60.00	50.28	44.75	35.48	32.27	19.34	25.35	18.52	26.45	30.72
70 and over	157.65	36.15	40.89	61.45	51.52	45.77	36.47	33.17	19.99	25.77	18.72	27.08	31.37

Table 51.—*Correlations of weight, stature and 6 girth measurements with 35 measurements of 10,042 women*

Measurement	Weight	Stature	Bust girth	Waist girth	Abdominal-extension girth	Hip girth	Midway thigh girth	Upper-arm girth
Stature	.2109	.0000	.0025	−.0711	−.0036	.1116	.0915	−.0374
Cervicale height	.2810	.9512	.0722	.0136	.0773	.1771	.1347	.0344
Bust height	.0264	.8894	−.1618	−.2415	−.1853	−.0524	−.0420	−.1923
Waist height	.2407	.9098	.0483	−.0213	.0581	.1509	.1069	.0024
Abdominal-extension height	.0903	.8328	−.0713	−.1397	−.1395	.0057	−.0144	−.1234
Hip height	.1040	.8346	−.0641	−.1006	−.0622	.0156	.0180	−.1182
Sitting-spread height	.1003	.8119	−.0496	−.1081	−.0583	.0278	−.0142	−.1141
Crotch height	.0345	.8469	−.1173	−.1862	−.1303	−.0650	−.0634	−.1754
Tibiale height	.1178	.7269	−.0194	−.0703	−.0288	.0369	.0499	−.0519
Ankle height	.0553	.3481	−.0245	−.0629	−.0485	.0165	.0247	−.0369
Total posterior arm length	.3018	.7310	.1477	.0991	.1455	.2150	.1465	.1007
Upper posterior arm length	.2651	.6505	.1262	.0880	.1288	.1875	.1158	.0858
Anterior arm length	.0416	.6572	−.0974	−.1487	−.1003	−.0180	−.0366	−.1402
Sitting height	.3158	.6499	.1523	.0909	.1595	.2561	.2284	.1507
Vertical trunk girth	.8852	.3255	.7951	.7827	.8033	.8113	.6825	.7628
Cervicale to waist anterior	.5441	.3619	.4913	.4321	.4107	.4435	.4082	.4568
Anterior waist length	.3867	.3351	.3283	.2931	.2701	.3028	.2816	.3026
Shoulder to waist	.4909	.3422	.4544	.3550	.3628	.4028	.3830	.4015
Neck to bust	.6327	.0349	.6572	.6370	.6436	.5727	.4713	.5999
Posterior waist length	.3610	.4271	.2522	.2754	.2629	.2876	.2162	.2368
Seye depth	.4569	.1601	.4121	.4525	.4705	.4129	.3018	.4037
Trunk line	−.1151	.2944	−.1895	−.2108	−.2248	−.1417	−.0827	−.1979
Arm length, shoulder to seye	.3789	.1883	.3796	.3604	.3899	.3610	.2658	.3304
Waist to hip	.3457	.2958	.2586	.2217	.2891	.3469	.2262	.2710
Total crotch length	.8191	.1800	.7349	.7293	.7920	.7972	.6684	.7302
Anterior crotch length	.7184	.1575	.6649	.6582	.7032	.6777	.5747	.6418
Shoulder length	.2623	.2084	.2112	.2017	.2031	.2177	.1835	.1997
Anterior chest width	.5969	.2170	.5730	.5206	.5100	.5123	.4545	.5351
Highest bust-level width	.5101	.1068	.5216	.4927	.4821	.4425	.3851	.4611
Posterior chest width	.6545	.0819	.6764	.6473	.6067	.5786	.4796	.5996
Anterior bust arc	.8306	−.0048	.9217	.8396	.8210	.7461	.6572	.8143
Anterior waist arc	.8311	−.0865	.8768	.9478	.8922	.7597	.6951	.8178
Abdominal-extension arc	.8500	−.0031	.8483	.8975	.9318	.8023	.6512	.8064
Posterior hip arc	.7874	.0707	.6815	.6822	.7349	.8630	.7265	.7087
Shoulder slope	−.0504	.0581	−.0868	−.0750	−.0657	−.0493	−.0199	−.0437

Table 52.—*Partial correlations of weight and 5 girth measurements with 34 measurements of 10,042 women, with stature and bust girth constant*

Measurement	Weight	Waist girth	Abdominal-extension girth	Hip girth	Midway thigh girth	Upper-arm girth
Cervicale height	.1522	.1462	.1351	.0833	−.0032	.0621
Bust height	−.0848	−.1666	−.1863	−.0774	−.0327	−.0772
Waist height	.0469	.0072	.1077	.0510	−.0279	−.0179
Abdominal-extension height	−.0918	−.0613	−.2800	−.0883	−.1014	−.1054
Hip height	−.0594	.0635	−.0023	−.0760	−.0321	−.1095
Sitting-spread height	−.1093	−.0132	−.0359	−.0627	−.1268	−.1361
Crotch height	−.1841	−.0811	−.1149	−.2105	−.1572	−.1566
Tibiale height	−.0620	.0033	−.0231	−.0683	−.0039	−.0184
Ankle height	.0127	−.0408	−.0567	−.0034	.0155	−.0038
Total posterior arm length	.0649	.0660	.0615	.0400	−.0447	.0030
Upper posterior arm length	.0556	.0680	.0599	.0326	−.0557	.0045
Anterior arm length	−.0281	−.0380	−.0470	−.0261	−.0528	−.0802
Sitting height	.1510	.0164	.0822	.1435	.1213	.1200
Vertical trunk girth	.5217	.3833	.4256	.4475	.2808	.3305
Cervicale to waist anterior	.0900	.0248	−.0589	.0140	.0630	.1113
Anterior waist length	.0646	.0475	−.0444	.0011	.0386	.0690
Shoulder to waist	.0364	−.1151	−.0968	−.0047	.0643	.0477
Neck to bust	.1219	.1237	.1778	.0859	.0251	.0781
Posterior waist length	.1350	.2219	.1044	.0733	.0055	.0801
Seye depth	.1544	.2455	.2553	.1198	.0035	.1160
Trunk line	−.0176	−.0417	−.1269	−.0382	.0327	−.0460
Arm length, shoulder to seye	−.0032	.0730	.1306	.0638	−.0212	.0162
Waist to hip	.1458	.0169	.1447	.1984	.0316	.1277
Total crotch length	.4811	.2663	.4686	.4847	.3069	.3032
Anterior crotch length	.3138	.2085	.3404	.2908	.1922	.1926
Shoulder length	.0791	.0622	.0393	.0436	.0273	.0514
Anterior chest width	.1217	.0341	.0119	.0548	.0681	.1150
Highest bust-level width	.0598	.0657	.0541	.0182	.0241	.0264
Posterior chest width	.1067	.1134	.0258	.0531	.0081	.0380
Anterior bust arc	.0284	−.0448	.0313	.0051	.0719	.0589
Anterior waist arc	.3392	.7406	.5265	.2197	.2842	.2185
Abdominal-extension arc	.4352	.5738	.7346	.3810	.1704	.2595
Posterior hip arc	.5707	.2177	.3899	.7230	.4766	.3303
Shoulder slope	.0401	.0232	.0246	.0255	.0491	.0704

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Abdominal-extension girth	
.8985	.9
.0124	.1
.0835	.1
−.1681	−.0
.0747	.1
−.1224	.0
−.0469	.0
−.0411	.0
−.1101	−.0
−.0030	.0
−.0225	.0
.1324	.1
.1062	.1
−.0703	.0
.1382	.2
.7863	.7
.4007	.4
.2674	.2
.3480	.3
.5612	.4
.2350	.2
.4592	.4
−.1973	−.1
.3961	.3
.2779	.3
.7838	.7
.7080	.6
.8517	.7
.8727	.7
.9256	.8
--------	.8

Table 3.—*Correlations among 59 measurements of 4,128 women*

Measurement	Stature	Cervicale height	Bust height	Waist height	Abdominal-extension height	Hip height	Sitting-spread height	Crotch height	Tibiale height	Ankle height	Total posterior arm length	Upper posterior arm length	Anterior arm length	Sitting height	Vertical trunk girth	Cervicale to waist anterior	Anterior waist length	Shoulder to waist	Neck to bust	Posterior waist length	Scye depth	Trunk line	Arm length, shoulder to scye	Waist to hip	Total crotch length	Anterior crotch length	Chest girth at armscye	Bust girth	Waist girth	Abdominal-extension girth	Hip girth	Sitting-spread girth	Maximum thigh girth	Midway thigh girth	Bent knee girth	Knee girth at tibiale	Maximum calf girth	Minimum leg girth	Ankle girth	Neck-base girth	Armscye girth	Upper-arm girth	Elbow girth	Forearm girth	Wrist girth	Shoulder length	Anterior chest width	Highest bust-level width	Posterior chest width	Anterior bust arc	Anterior waist arc	Abdominal-extension arc	Posterior hip arc	Bust girth over foundation garment	Waist girth over foundation garment	Abdominal-extension girth over foundation garment	Hip girth over foundation garment	Angle of shoulder slope
Weight	.2264	.2878	.0420	.2568	.1063	.1210	.1115	.0544	.1427	.0779	.2892	.2454	.0732	.3019	.8795	.5376	.3822	.4773	.5546	.3387	.4528	−.0842	.3593	.3360	.8168	.7215	.8874	.8926	.8755	.8985	.9174	.9063	.8779	.8295	.7745	.7685	.7628	.6030	.5464	.6803	.8249	.8742	.7453	.8254	.6524	.2790	.6102	.5470	.6447	.8253	.8249	.8475	.7726	.8890	.8715	.8963	.9174	−.0445
Vertical measurements:																																																											
Stature		.9493	.8880	.9092	.8350	.8262	.8043	.8480	.7399	.3192	.7484	.6803	.6636	.6710	.3568	.3910	.3626	.3577	.0376	.4555	.1709	.2902	.2222	.3151	.1951	.1704	.0737	.0206	−.0497	.0124	.1257	.0895	.1011	.0771	.2300	.1825	.1625	.1556	.2730	.1919	.1203	−.0269	.1643	.1401	.2492	.2110	.2259	.0979	.1038	−.0028	−.0670	.0085	.0939	.0183	−.0530	.0180	.1185	.0454
Cervicale height			.8722	.9178	.8412	.8322	.8120	.8487	.7495	.3178	.7648	.6982	.6584	.6938	.4124	.3576	.3546	.3611	.0791	.5235	.2500	.2024	.2516	.3231	.2466	.2066	.1318	.0803	.0269	.0835	.1814	.1783	.1537	.1173	.2727	.2307	.1900	.1809	.2996	.2159	.1793	.0357	.2029	.1904	.2916	.2393	.2525	.1245	.1433	.0518	.0106	.0827	.1334	.0756	.0238	.0870	.1764	.0421
Bust height				.8976	.8280	.8161	.7975	.8326	.7208	.3009	.6867	.6241	.6516	.5790	.1676	.2587	.2633	.2221	−.2047	.3307	.0322	.3034	.1122	.2413	.0342	.0233	−.0762	−.1353	−.2185	−.1681	−.0371	−.0753	−.0371	−.0535	.0984	.0508	.0315	.0462	.1691	.0578	−.0172	−.1843	.0328	−.0033	.1087	.0991	.1086	−.0175	−.0202	−.1808	.2189	−.1616	−.0341	−.1377	−.2239	−.1622	−.0444	.0181
Waist height					.8652	.8614	.8452	.8746	.7676	.3043	.7751	.6924	.6653	.5701	.3313	.2096	.1481	.2013	.0521	.2758	.1805	.1001	.2458	.3861	.2916	.2468	.1126	.0695	.0011	.0747	.1642	.1393	.1351	.0972	.2512	.2026	.1665	.1421	.2610	.1936	.1441	.0160	.1816	.1604	.2470	.2256	.2279	.1058	.1293	.0413	−.0173	.0731	.1161	.0962	−.0022	.0777	.1591	.0291
Abdominal-extension height						.8235	.8121	.8468	.7205	.2931	.7198	.6426	.6492	.4799	.1704	.1989	.1653	.1739	−.0431	.2998	.1150	.1811	.1347	.2275	.0701	.0539	−.0078	−.0516	−.1153	−.1224	.0230	−.0118	.0061	−.0247	.1394	.0943	.0655	.0800	.2038	.1095	.0245	−.1104	.0779	.0424	.1572	.1785	.1406	.0540	.0596	−.0810	−.1261	−.0974	.0126	−.0533	−.1183	−.1203	.0184	.0366
Hip height							.8375	.8628	.7220	.2875	.7360	.6599	.6547	.4604	.1696	.1922	.1692	.1845	−.0297	.2931	.1184	.1803	.1664	−.0309	.0658	.0580	−.0031	−.0128	−.0529	−.0469	.0287	.0183	.0132	.0080	.1197	.1304	.0529	.0710	.1810	.1091	.0362	−.1059	.0990	.0423	.1380	.1589	.1399	.0646	.0572	−.0760	−.1109	−.0408	−.0004	−.0159	−.1061	−.0434	.0253	.0134
Sitting-spread height								.8489	.7178	.2764	.7152	.6398	.6389	.4262	.1594	.1896	.1555	.1656	−.0418	.2868	.1308	.1690	.1501	.1618	.0586	.0438	.0116	−.0305	−.0817	−.0411	.0429	−.0378	−.0024	−.0267	.1373	.0777	.0440	.0601	.1984	.0962	.0406	−.1024	.0798	.0402	.1357	.1565	.1401	.0296	.0428	−.0553	.0988	−.0170	.0311	−.0324	−.0859	−.0385	.0371	.0211
Crotch height									.7604	.2705	.7380	.6598	.6787	.4418	.0942	.1948	.1732	.1879	−.0671	.2827	.0770	.1778	.1251	.1623	−.0233	−.0117	−.0383	−.0851	−.1539	−.1101	.0154	−.0638	−.0478	−.0733	.0955	.0399	.0132	.0169	.1666	.0722	−.0141	−.1567	.0324	−.0021	.1212	.1504	.1134	.0154	.0176	−.1098	−.1630	−.1116	−.0167	−.0874	−.1580	−.1077	−.0504	.0282
Tibiale height										.2607	.6415	.5687	.5798	.4311	.1865	.2084	.1852	.1962	−.0173	.2996	.1368	.1578	.1425	.2213	.0909	.0951	.0401	.0063	−.0417	−.0930	.0629	.0313	.0470	.0475	.1933	.1999	.0951	.0943	.2104	.1146	.0650	−.0468	.1054	.0600	.1836	.2166	.1708	.0378	.0676	−.0182	−.0587	−.0122	.0500	.0034	−.0151	−.0010	.0582	.0221
Ankle height											.2357	.2275	.2121	.2464	.1245	.1233	.1087	.1023	−.0060	.1411	.0536	.0940	.1040	.0926	.0563	.0694	.0358	.0067	−.0352	−.0225	.0483	.0191	.0369	.0397	.0595	.0555	.0764	.0688	.0567	.0759	.0363	−.0148	.0616	.0789	.1241	.0863	.1280	.0017	.0556	−.0012	−.0145	−.0101	.0367	.0058	−.0376	−.0192	.0439	−.0134
Total posterior arm length												.8821	.7431	.4362	.3010	.2774	.2299	.2504	.1039	.3416	.2618	.1120	.3250	.2219	.1958	.1763	.1876	.1394	.0865	.1324	.1949	.1671	.1580	.1098	.2525	.2159	.1809	.1632	.2933	.2225	.2422	.0764	.2410	.2136	.3224	.1755	.2709	.1770	.1784	.1022	.0690	.1168	.1594	.1371	.0824	.1353	.1900	−.0148
Upper posterior arm length													.6589	.4169	.2713	.2602	.2231	.2261	.0921	.3503	.2647	.1114	.3473	.2020	.1712	.1597	.1506	.1078	.0610	.1052	.1644	.1407	.1319	.0763	.2037	.1743	.1442	.1455	.2549	.1703	.2325	.0533	.2107	.1842	.0871	.1155	.2320	.1395	.1302	.0729	.0416	.0870	.1455	.1073	.0581	.1095	.1610	−.0093
Anterior arm length														.3449	.0927	.1928	.1893	.1594	−.0360	.2572	.0835	.2358	.0781	.1370	.0104	.0229	−.0170	−.0654	−.1164	−.0703	.0126	−.0210	−.0155	−.0301	.0908	.0139	.0408	.0382	.1663	.0720	−.0262	−.1224	.0250	.0044	.1487	.2059	.1358	.0507	.0511	−.0855	−.1222	−.0675	.0016	−.0595	−.1198	−.0561	.0058	.0257
Sitting height															.4941	.4201	.4029	.4011	.1142	.5545	.2785	.2770	.2476	.3153	.3387	.2846	.1766	.1358	.0805	.1382	.2399	.2132	.2226	.1930	.2519	.2473	.2248	.2061	.3524	.2005	.2140	.1324	.2303	.2426	.2710	.1843	.2220	.1206	.1654	.1079	.0751	.1437	.1807	.1341	.0757	.1404	.2250	−.0561
Vertical trunk girth																.6023	.4825	.5561	.5158	.4714	.4494	.0788	.4450	.3888	.8210	.7244	.7798	.7779	.7694	.7863	.7931	.7798	.7343	.6700	.6575	.6598	.6170	.6216	.4984	.6124	.7579	.7446	.6186	.7143	.6190	.4271	.1597	.4375	.3658	.3443	.4752	.4168	.3818	.3702	.4752	.4160	.4011	.4301	−.0137
Cervicale to waist anterior																	.8240	.7503	.3278	.6235	.2103	.3411	.2299	.1168	.2783	.2479	.4995	.4776	.4221	.4007	.4329	.3998	.4146	.3909	.3908	.3815	.3757	.3278	.3730	.4819	.4861	.4315	.4157	.4417	.4271	.1088	.3102	.2841	.1923	.3298	.3034	.2636	.2541	.3146	.2861	.2980	.2940	−.0072
Anterior waist length																		.6960	.2392	.5564	.1947	.4147	.1472	.0401	.1303	.1252	.3360	.3175	.2909	.2674	.2951	.2686	.2812	.2659	.2823	.2840	.2639	.2415	.2811	.2549	.3423	.2800	.2800	.2966	.3133	.1088	.3102	.2841	.1923	.3298	.3034	.2636	.2541	.3146	.2861	.2980	.2940	−.0072
Shoulder to waist																			.3923	.4817	.1524	.3474	.2639	.1192	.2398	.2045	.4235	.4413	.4378	.3480	.3822	.3538	.3890	.3518	.3465	.3153	.3358	.2712	.2986	.3778	.4355	.3803	.3470	.3814	.3309	.1398	.4131	.2884	.2019	.4780	.3356	.3295	.3146	.4391	.3333	.3196	.3816	−.0626
Neck to bust																				.1881	.3100	−.0948	.2914	.1776	.4735	.4245	.5275	.5656	.5531	.5612	.4912	.4972	.4531	.4037	.3750	.3867	.3627	.2701	.2627	.3780	.5144	.5271	.3922	.4426	.3555	.2115	.3813	.3508	.3411	.5942	.5282	.5139	.3838	.5637	.5549	.5570	.4953	.0002
Posterior waist length																					.4540	.3973	.1895	.0656	.1353	.1430	.2463	.2191	.2484	.2350	.2674	.2420	.2330	.1898	.2681	.2725	.2272	.2429	.2888	.2080	.2881	.1992	.2465	.2479	.3205	.1915	.2060	.1676	.2552	.1669	.2277	.2276	.2226	.2150	.2461	.2364	.2656	−.0506
Scye depth																						−.1146	.3371	.1775	.3959	.3690	.4122	.3958	.4464	.4592	.4101	.4196	.3615	.2982	.3344	.3365	.2939	.2697	.2904	.2101	.4398	.4006	.3122	.3716	.3830	.2269	.2930	.2277	.3193	.3546	.4248	.4334	.3458	.3934	.4476	.4515	.4114	.0932
Trunk line																							−.0944	−.1371	−.2109	−.1833	−.1587	.1620	−.1749	−.1973	.1083	−.1522	−.1061	−.0867	−.0582	−.0677	−.0476	−.0073	.0184	−.0372	−.1180	−.1807	−.0970	−.1181	−.0079	−.0010	−.0057	−.0234	−.0933	−.1664	−.1839	−.1953	−.0714	−.1655	−.1788	−.1928	−.1120	−.1140
Arm length, shoulder to scye																								.2386	.4164	.3772	.4112	.3887	.3627	.3961	.3632	.3788	.3394	.2709	.2698	.2772	.2654	.1998	.2138	.2863	.5211	.3487	.3156	.3837	.3025	.0126	.2481	.1932	.2875	.3560	.3356	.3630	.3028	.3863	.3591	.3952	.3645	−.0808
Waist to hip																									.4794	.4071	.2524	.2442	.2054	.2442	.2779	.3365	.3034	.3006	.2187	.3156	.2977	.2711	.2319	.2096	.1946	.2658	.2591	.2684	.2721	.2415	.1569	.2132	.0926	.1582	.2539	.1956	.2641	.2831	.2442	.2059	.2778	.3331	−.0327
Total crotch length																										.8390	.7215	.7236	.7209	.7838	.7871	.7819	.7249	.6698	.6220	.6216	.5853	.4620	.4141	.5255	.6791	.7309	.6071	.6737	.5236	.2319	.4770	.4279	.5093	.6710	.6870	.7603	.6402	.7231	.7198	.7810	.7879	−.0105
Anterior crotch length																											.6548	.6586	.6908	.7080	.6676	.6767	.6085	.5654	.5357	.5393	.5068	.3760	.3375	.4686	.6024	.6391	.5321	.5781	.4567	.2008	.4305	.3967	.4707	.6095	.6276	.6896	.5418	.6578	.6586	.7061	.6689	−.0452
Horizontal measurements:																												.9328	.8802	.8517	.7875	.7836	.7438	.6910	.6226	.6189	.6094	.4617	.4352	.6679	.8073	.8625	.6970	.7712	.5891	.2540	.6201	.5624	.6995	.8460	.8349	.8131	.6522	.9297	.8738	.8492	.7904	−.0678
Chest girth at armscye																													.9052	.8727	.7926	.7917	.7433	.6912	.6165	.6159	.6106	.4569	.4219	.6432	.8034	.8604	.6764	.7514	.5664	.2239	.5798	.5617	.6591	.9148	.8923	.8397	.6503	.9038	.8985	.8681	.7966	−.0848
Bust girth																														.9256	.8006	.8083	.7201	.6642	.6165	.6252	.5776	.4639	.4326	.6199	.7857	.8487	.6527	.7114	.5790	.2203	.5356	.5444	.6255	.8338	.9440	.9364	.6484	.9026	.9933	.9203	.8087	−.0641
Waist girth																															.8633	.8721	.7861	.7234	.6540	.6638	.6068	.4729	.4357	.5879	.7869	.8503	.6534	.7179	.5681	.2220	.5246	.5163	.5912	.8176	.8871	.9304	.7047	.8710	.9247	.9942	.8078	−.0528
Abdominal-extension girth																																.9407	.9120	.8426	.7477	.7494	.7285	.5769	.4960	.5661	.7409	.8216	.6783	.7952	.5684	.2294	.5203	.4680	.5616	.7320	.7434	.7889	.8609	.7901	.7991	.8605	.9924	−.0432
Hip girth																																	.8995	.8386	.7412	.7271	.7218	.5570	.4700	.5566	.7398	.8123	.6554	.7356	.5433	.2037	.4995	.4635	.5392	.7258	.7615	.8079	.8095	.7897	.8081	.8886	.9379	−.0399
Sitting-spread girth																																		.9096	.7358	.7486	.7513	.5662	.4546	.5275	.7066	.8068	.6568	.7548	.5106	.1963	.4878	.4361	.5133	.6972	.6698	.7065	.8151	.7421	.7182	.7816	.9018	−.0212
Maximum thigh girth																																			.7402	.7531	.7720	.5819	.4615	.5094	.6435	.7587	.6254	.7277	.5015	.2080	.4680	.4057	.4799	.6562	.6264	.6539	.7431	.6894	.6621	.7220	.8346	−.0241
Midway thigh girth																																				.8528	.7667	.6650	.5813	.4814	.6011	.6511	.6112	.6664	.5920	.2154	.4458	.3837	.4190	.5783	.5713	.6006	.6479	.6157	.6160	.6527	.7416	−.0198
Bent knee girth																																					.7540	.6627	.5563	.4828	.6102	.6622	.6117	.6729	.5391	.2091	.4407	.3724	.4175	.5807	.5812	.6074	.6538	.6160	.6247	.6632	.7445	−.0135
Knee girth at tibiale																																						.7232	.5620	.4776	.5671	.6372	.5935	.6885	.5368	.2086	.4276	.3578	.4424	.5631	.5223	.5516	.6453	.6068	.5755	.6076	.7236	−.0226
Maximum calf girth																																							.6924	.3844	.4469	.4785	.5068	.5662	.6009	.1785	.3316	.2831	.3395	.1127	.4164	.4339	.5122	.4554	.4630	.4761	.5735	−.0200
Minimum leg girth																																								.3704	.4467	.4033	.4857	.4093	.6027	.1815	.3322	.3277	.3270	.3865	.3942	.4140	.4242	.4205	.4285	.4377	.4930	−.0031
Ankle girth																																									.6005	.6118	.5518	.6038	.4856	.1933	.5145	.4600	.5300	.5769	.5824	.5671	.4678	.6425	.6122	.5900	.5692	.0000
Neck-base girth																																										.8271	.6971	.7476	.5988	.1467	.5381	.4951	.5320	.7554	.7589	.7497	.6116	.7993	.7856	.7842	.7402	−.0606
Armscye girth																																											.7228	.8142	.5776	.2155	.5438	.5085	.5840	.8038	.8077	.8026	.6850	.8588	.8446	.8464	.8210	−.0254
Upper-arm girth																																												.8369	.6159	.1956	.4836	.4212	.4961	.6203	.6209	.5684	.6739	.6488	.5505	.6758	−.0033
Elbow girth																																													.6465	.2123	.5219	.4478	.5462	.6904	.6732	.6769	.6365	.7488	.7068	.7170	.7511	−.0006
Forearm girth																																														.2575	.4520	.4005	.4350	.5105	.5366	.5401	.4744	.5617	.5769	.5972	.5675	−.0205
Wrist girth																																															.3788	.1421	.3009	.1821	.1910	.2204	.1558	.2187	.2220	.2240	.2295	.2791	.2265	−.1534
Shoulder length																																																.4783	.2669	.5879	.5151	.4989	.4251	.5753	.5310	.5240	.5205	−.0279
Anterior chest width																																																	.3596	.5561	.5380	.5132	.3746	.5610	.5400	.5132	.4683	−.0232
Highest bust-level width																																																		.5085	.5675	.5612	.4704	.6566	.6207	.5920	.5646	−.0371
Posterior chest width																																																			.8432	.8163	.5626	.9108	.8297	.8124	.7357	−.0713
Anterior bust arc																																																				.9237	.5377	.8595	.9386	.8508	.7533	−.0544
Anterior waist arc																																																					.5312	.8375	.8950	.9250	.7982	−.0546
Abdominal-extension arc																																																						.6445	.6479	.7034	.8517	−.0239
Posterior hip arc																																																							.8950	.8650	.7939	−.0852
Bust girth over foundation garment																																																								.9204	.8069	−.0607
Waist girth over foundation garment																																																									.8660	−.0518
Abdominal-extension girth over foundation garment																																																											−.0418
Hip girth over foundation garment																																																											

[1] Overlapping measurements.

Table 4.—*Partial correlations among 59 measurements of 4,128 women, with age constant*

Measurement	Stature	Cervicale height	Bust height	Waist height	Abdominal-extension height	Hip height	Sitting-spread height	Crotch height	Tibiale height	Ankle height	Total posterior arm length	Upper posterior arm length	Anterior arm length	Sitting height	Vertical trunk girth	Cervicale to waist anterior	Anterior waist length	Shoulder to waist	Neck to bust	Posterior waist length	Scye depth	Trunk line	Arm length, shoulder to scye	Waist to hip	Total crotch length	Anterior crotch length	Chest girth at armscye	Bust girth	Waist girth	Abdominal-extension girth	Hip girth	Sitting-spread girth	Maximum thigh girth	Midway thigh girth	Bent knee girth	Knee girth at tibiale	Maximum calf girth	Minimum leg girth	Ankle girth	Neck-base girth	Armscye girth	Upper-arm girth	Elbow girth	Forearm girth	Wrist girth	Shoulder length	Anterior chest width	Highest bust-level width	Posterior chest width	Anterior bust arc	Anterior waist arc	Abdominal-extension arc	Posterior hip arc	Bust girth over foundation garment	Waist girth over foundation garment	Abdominal-extension girth over foundation garment	Hip girth over foundation garment	Angle of shoulder slope
Weight	.2989	.3333	.1468	.3016	.1641	.1838	.1747	.1338	.1893	.1170	.3053	.2580	.1255	.3276	.8619	.5519	.3897	.5041	.4953	.3219	.3098	.0134	.2956	.3175	.7884	.6801	.8708	.8708	.8681	.8952	.9074	.8927	.8749	.8341	.7631	.7498	.7727	.6024	.5334	.6681	.7978	.8555	.7237	.8118	.6127	.2695	.5877	.5090	.6223	.8001	.8070	.8341	.7612	.8727	.8645	.8913	.9068	-.0548
Vertical measurements:																																																												
Stature		.9517	.8900	.9107	.8318	.8225	.8001	.8447	.7370	.3106	.7578	.6893	.6574	.6761	.4479	.4045	.3743	.3636	.0934	.4800	.2473	.2628	.2733	.3379	.2821	.2454	.1426	.0829	.0317	.1034	.1842	.1559	.1394	.1043	.2717	.2299	.1845	.1766	.3014	.2255	.2036	.0320	.2113	.1865	.3106	.2255	.2649	.1386	.1400	.0547	.0139	.1023	.1304	.0807	.0292	.1084	.1786	.0488
Cervicale height			.8870	.9174	.8415	.8328	.8125	.8539	.7482	.3137	.7673	.7006	.6565	.6945	.4731	.3935	.3593	.3630	.1090	.5358	.3057	.2539	.2804	.3341	.3016	.2512	.1721	.1151	.0739	.1391	.2154	.1875	.1743	.1310	.2358	.2375	.2398	.1911	.3142	.2333	.2308	.0374	.2292	.2163	.3232	.2459	.2728	.1457	.1623	.0327	.0566	.1408	.1526	.1102	.0713	.1421	.2115	.0435
Bust height				.8815	.8292	.8153	.7953	.8465	.7237	.2886	.7137	.6494	.6463	.5958	.2959	.2850	.2866	.2238	-.1282	.3751	.1471	.2492	.1947	.2833	.1599	.1353	.0278	-.0408	-.0095	-.0401	.0512	.0234	.0237	-.0100	.1657	.1201	.0707	.0815	.2180	.1123	.0729	-.0941	.1076	.0692	.2034	.1241	.1712	.0486	.0383	-.0952	-.0963	-.0284	.0246	-.0430	.1042	-.0352	.0461	.0242
Waist height					.8655	.8621	.8448	.8798	.7603	.2997	.7778	.6950	.6531	.5706	.3873	.2150	.1523	.2028	.0816	.2864	.2255	.0335	.2755	.3982	.3529	.2093	.1529	.1351	.0159	.1311	.1985	.1791	.1551	.1113	.2747	.2291	.1776	.1524	.2757	.2114	.1605	.0177	.2082	.1862	.2326	.2325	.2485	.1274	.1460	.0729	.0259	.1319	.1357	.1038	.0429	.1335	.1946	.0307
Abdominal-extension height						.8201	.8085	.8445	.7234	.2848	.7274	.6497	.6433	.4823	.2392	.2092	.1737	.1763	.0018	.3195	.1804	.1516	.1777	.2468	.1375	.1127	.0177	-.0314	-.0542	-.0335	.0370	.0404	.0375	.0324	.1745	.1339	.0838	.0378	.2282	.1379	.0602	-.0649	.1172	.0805	.2086	.1911	.1727	.0894	.0911	-.0354	-.0554	-.0322	.0431	-.0031	-.0569	-.0518	.0967	.0396
Hip height							.8341	.8602	.7188	.2787	.7449	.6683	.6485	.4630	.2425	.2033	.1783	.1884	.0197	.3141	.1884	.1481	.2138	-.0147	.1372	.1214	.0570	.0122	.0257	.0314	.0795	.0770	.0473	.0128	.1555	.1713	.0724	.0399	.2067	.1396	.1030	-.0059	.1108	.0831	.1915	.1723	.1743	.1031	.0910	-.0261	-.0410	-.0113	.0319	.0190	-.0393	.0241	.0775	.0164
Sitting-spread height								.8457	.7146	.2672	.7241	.6482	.6324	.4287	.2326	.2009	.1617	.1694	.0078	.3083	.2032	.1355	.1977	.1818	.1306	.1071	.0743	.0238	-.0057	-.0399	.0357	.0995	.0318	-.0023	.1755	.1201	.0336	.0792	.2250	.1269	.1143	-.0509	.1228	.0817	.2145	.1701	.1754	.0542	.0768	.1175	-.0247	-.0357	.0552	.0250	-.0105	.0416	.0913	.0243
Crotch height									.7596	.2589	.7545	.6751	.6724	.4476	.1844	.2113	.1569	.1944	-.0005	.3128	.1675	.1308	.1875	.1901	.0940	.0584	.0419	-.0115	.0037	-.0101	.0193	.0098	-.0331	-.0115	.1453	.0033	.0393	.0121	.2023	.1132	.0785	-.0803	.0881	.0520	.1930	.1696	.1599	.0962	.0628	-.0383	.0389	-.0087	-.0037	-.0137	-.0342	-.0387	.0160	.0328
Tibiale height										.2542	.6454	.5725	.5748	.4317	.2413	.2158	.1912	.1985	.0537	.3140	.1889	.1368	.1753	.2383	.1440	.1427	.0848	-.0170	.0110	.0555	.1090	.0728	.0723	.0152	.2213	.2338	.1039	.1075	.2236	.1359	.1182	-.0101	.1359	.0889	.2244	.2260	.1957	.0635	.0912	.0188	-.0073	.0168	.0735	.0140	.0080	.0599	.0953	.0242
Ankle height											.2374	.2293	.2033	.2461	.1711	.1295	.1137	.1039	.0290	.1527	.1278	.0722	.1331	.1012	.1024	.1117	.0768	.0442	.0140	.0280	.0819	.0566	.0502	.0558	.0817	.0816	.0889	.0807	.0713	.0945	.0827	.0215	.0882	.1062	.1591	.0940	.1501	.0242	.0374	.0309	.0047	.0338	.0581	.0435	.0120	.0310	.0784	-.0116
Total posterior arm length												.8821	.7501	.4364	.3210	.2775	.2398	.2503	.1074	.3458	.2790	.1193	.3347	.2221	.2108	.1897	.1998	.1471	.0953	.1494	.2329	.1765	.1903	.1039	.2570	.2211	.1813	.1634	.2953	.2249	.2636	.0792	.2476	.2190	.3354	.1763	.2750	.1803	.1808	.1055	.0764	.1324	.1615	.1448	.0919	.1534	.1983	-.0149
Upper posterior arm length													.6655	.4171	.2915	.2600	.2228	.2260	.0941	.3514	.2819	.1189	.3573	.2022	.1830	.1680	.1590	.1123	.0552	.1177	.1701	.1473	.1361	.0756	.2065	.1775	.1410	.1454	.2592	.1714	.2520	.0534	.2156	.1880	.0381	.1151	.2348	.1411	.1311	.0743	.0427	.0961	.1469	.1118	.0920	.1211	.1669	-.0095
Anterior arm length														.3458	.1514	.1870	.1973	.1624	.0967	.2750	.1428	.2110	.1162	.1537	.0679	.0758	.0344	-.0196	-.0301	-.0058	.0533	.0274	.0134	-.0032	.1223	.0792	.0576	.0543	.1886	.0979	.0301	-.0821	.0590	.0295	.1969	.2130	.1651	.0840	.0306	-.0431	-.0356	-.0014	.0300	-.0227	-.0194	-.0327	.0515	.0315
Sitting height															.5387	.4218	.4042	.4014	.1297	.5598	.3073	.2839	.2909	.3192	.3779	.3131	.1979	.1529	.1037	.1704	.2585	.2334	.2321	.1984	.2917	.2598	.2236	.2095	.3657	.2070	.2135	.1498	.2127	.2554	.2339	.1390	.2299	.1230	.1727	.1218	.0937	.1788	.1336	.1512	.1023	.1720	.2554	.0564
Vertical trunk girth																.6238	.5006	.5939	.4463	.4061	.3555	.2011	.3871	.3749	.7895	.6797	.7428	.7414	.7263	.7472	.7593	.7147	.7189	.6533	.6356	.6222	.6189	.5169	.4825	.5955	.7136	.7019	.6162	.6889	.5728	.2340	.5422	.4123	.5163	.6735	.6784	.7169	.6311	.7377	.7224	.7450	.7671	-.0649
Cervicale to waist anterior																	.8235	.7510	.3271	.5210	.2028	.3763	.2221	.1107	.2782	.2432	.5171	.4920	.4588	.4318	.4373	.4057	.4123	.3889	.3876	.3792	.3717	.3234	.3538	.4830	.5094	.4152	.4154	.4419	.4295	.1557	.4350	.3524	.3338	.4374	.4566	.4130	.3635	.4897	.4537	.4309	.4353	-.0150
Anterior waist length																		.6962	.2366	.5550	.1903	.4465	.1394	.0346	.1206	.1150	.3430	.3231	.3112	.2524	.2951	.2395	.2773	.2516	.2785	.2809	.2300	.2375	.2771	.2503	.3552	.2829	.2769	.2941	.3132	.1053	.3376	.2308	.1862	.3350	.3236	.2300	.2496	.3201	.3058	.2923	.2944	-.0082
Shoulder to waist																			.4119	.4833	.1591	.3654	.2588	.1184	.2507	.2150	.4536	.4713	.3881	.3980	.3900	.3753	.3993	.3577	.3522	.3536	.3538	.2716	.3300	.3520	.4747	.4054	.3556	.3914	.3427	.1392	.4192	.2938	.2038	.5081	.3896	.3801	.3194	.4559	.3848	.3931	.3934	-.0629
Neck to bust																				.1607	.2086	-.0015	.2291	.1480	.3904	.3414	.4572	.5024	.4591	.4798	.4293	.4258	.4106	.4138	.3738	.3273	.3300	.3426	.2546	.2230	.3406	.4352	.4571	.3354	.3002	.2528	.1973	.3391	.2917	.2918	.5374	.4356	.4571	.3373	.5030	.4708	.4752	.4317	-.0070
Posterior waist length																					.4477	.4481	.1682	.0534	.0989	.1098	.2217	.1922	.2243	.2983	.2430	.2174	.2146	.1745	.2511	.2539	.2161	.2325	.2769	.1917	.2575	.1703	.2267	.2281	.3027	.1845	.1834	.1458	.2176	.1363	.2301	.1938	.2343	.1577	.2218	.2093	.2439	-.0187
Scye depth																						-.0108	.2716	.1453	.2851	.2843	.3110	.2943	.3141	.3123	.3248	.3250	.3354	.2558	.2778	.2575	.2377	.2132	.2554	.1532	.3325	.3231	.2732	.3053	.3347	.2139	.2332	.1515	.2328	.2508	.2826	.2960	.2909	.2910	.3137	.3280	.3273	-.0926
Trunk line																							.0282	-.1100	-.1116	-.0594	-.0584	-.0354	-.0398	-.0334	-.0214	-.0511	-.0432	-.0123	.0030	.0333	-.0131	.0277	.0314	.0153	-.0150	-.0838	-.0276	-.0496	.0322	.0214	-.0538	.0465	-.0358	-.0732	-.0132	-.0598	-.0115	-.0578	-.0392	-.0328	-.0225	-.1129
Arm length, shoulder to scye																								.2182	.3503	.3170	.3473	.3233	.2729	.3143	.3116	.3137	.2374	.2331	.2248	.2248	.2123	.1750	.1828	.2301	.4331	.2774	.2977	.3381	.2424	-.0068	.2036	.1422	.2476	.2948	.2483	.2527	.2931	.3214	.2778	.3223	.3029	-.0855
Waist to hip																									.4765	.3948	.2266	.2178	.1710	.2393	.3131	.2323	.2335	.2035	.2993	.2791	.2602	.2209	.1938	.1772	.2408	.2339	.2155	.2522	.2131	.1493	.1949	.0670	.1373	.2237	.1590	.2406	.2579	.2178	.1715	.2553	.3144	.0306
Total crotch length																										.8105	.6995	.6733	.6519	.7328	.7588	.7410	.7111	.6950	.5974	.5850	.5892	.4550	.3912	.5011	.6118	.6810	.5697	.6540	.4693	.2198	.4408	.3717	.4725	.6142	.6072	.7025	.6184	.6725	.6501	.7233	.7578	-.0204
Anterior crotch length																											.5964	.6021	.5882	.6481	.6232	.6248	.5796	.5496	.5010	.4914	.4993	.3589	.3071	.4377	.5281	.5784	.4861	.6367	.3889	.1857	.3003	.3405	.4307	.5477	.5451	.6246	.5081	.6010	.5850	.6459	.6228	-.0569
Horizontal measurements:																																																												
Chest girth at armscye																												.9212	.8255	.7595	.7473	.7304	.6885	.5973	.5833	.6125	.4529	.4130	.6576	.7703	.8334	.6703	.7530	.5376	.2434	¹.5996	.5242	¹.6842	.8210	.8065	.7776	.6306	.9177	.8554	.8213	.7613	-.0819
Bust girth																													.8962	.8542	.7654	.7530	.7232	.6377	.5904	.5801	.6127	.4471	.3902	.6237	.7638	.8309	.6472	.7305	.5127	.2107	.5548	.5237	.6390	¹.9013	.8141	.8141	.6232	¹.9327	.8392	.8477	.7656	-.0998
Waist girth																														.8982	.7837	.7768	.7244	.6359	.6029	.5964	.6048	.4731	.4206	.6239	.7341	.8232	.6288	.6690	.5195	.2113	.5143	.5036	.6161	¹.8103	¹.9222	.8567	.6420	.8328	¹.9008	.8313	.7204	-.0573
Abdominal-extension girth																															.8597	.8562	.8017	.7538	.6164	.6121	.6359	.4321	.4234	.5842	.7320	.8244	.6256	.7055	.5054	.2129	.5002	.4713	.5737	.7892	.8441	¹.9044	.7078	.8517	.8365	¹.9322	.8323	-.0737
Hip girth																																.9341	.8598	.8447	.7527	.7288	.7321	.5721	.4785	.5440	.7049	.7985	.6507	.7355	.5224	.2164	.4936	.4219	.5324	.6972	.7147	.7702	¹.8555	.7626	.7832	.8550	¹.9216	-.0524
Sitting-spread girth																																	.9012	.8475	.7278	.7209	.7320	.5551	.4521	.5342	.6930	.7814	.6239	.7126	.4577	.1888	.4554	.4151	.5034	.6958	.7186	.7769	¹.8035	.7555	.7777	.8509	¹.9301	-.0509
Maximum thigh girth																																		.9077	.7219	.7334	.7479	.5571	.4368	.5070	.6920	.8003	.6357	.7398	.4762	.1839	.4632	.4034	.4382	.6775	.6371	.7096	.8054	.7279	.7241	.7931	¹.9327	-.0265
Midway thigh girth																																			.7312	.7451	.7677	.5738	.4476	.4599	.6410	.7626	.6110	.7186	.4795	.1983	.4194	.3316	.4338	.6480	.6449	.6754	.7343	.6559	.6357	.7499	.8374	-.0279
Bent knee girth																																				.8446	.7635	.6591	.5386	.4594	.5780	.6290	.5832	.6466	.5551	.2039	.4198	.3492	.3900	.5482	.5503	.5348	.6300	.5535	.6036	.6318	.7234	-.0249
Knee girth at tibiale																																					.7525	.6582	.5420	.4581	.5731	.6318	.5343	.6495	.5447	.1962	.4105	.3311	.3838	.5414	.5443	.5755	.6337	.5532	.5937	.6405	.7213	-.0193
Maximum calf girth																																						.7188	.5536	.4658	.5715	.6425	.5351	.6843	.5270	.2010	.4137	.3308	.4234	.5595	.5430	.5757	.6380	.6088	.6045	.6330	.7282	-.0253
Minimum leg girth																																							.6869	.3709	.4308	.4710	.4957	.5577	.5960	.1708	.3157	.2634	.3232	.3984	.4194	.4387	.5013	.4455	.4735	.4346	.5592	-.0226
Ankle girth																																								.3526	.4231	.3789	.4680	.4760	.5914	.1723	.3118	.3039	.3353	.3606	.3765	.3202	.4057	.3377	.4167	.4249	.4753	-.0062
Neck-base girth																																									.5860	.5956	.5306	.5854	.4584	.1825	.4954	.4353	.5105	.5562	.5821	.5619	.4454	.6290	.6164	.5854	.5474	-.0038
Armscye girth																																										.7942	.6717	.7288	.5456	.1259	.5095	.4468	.4362	.7123	.6950	.6333	.5870	.7618	.7300	.7288	.7020	-.0764
Upper-arm girth																																											.6992	.8312	.5247	.2916	.5151	.4641	.5525	.7720	.7722	.7649	.6670	.8346	.8187	.8139	.7965	-.0359
Elbow girth																																												.8252	.5842	.1822	.4558	.3828	.4669	.5849	.5909	.5909	.5430	.6443	.6251	.6243	.6476	-.0088
Forearm girth																																													.6171	.1995	.4960	.4109	.5198	.6623	.6550	.6581	.6150	.7276	.6948	.7033	.7297	-.0047
Wrist girth																																														.2462	.4185	.3543	.3974	.4514	.4662	.4712	.4390	.5071	.5162	.5045	.5200	-.0278
Shoulder length																																															.3718	.1274	.2919	.1655	.1774	.2119	.1426	.2051	.2138	.2148	.2155	.1724	.2081	.2158	.2148	.2155	.1523
Anterior chest width																																																.4518	.2333	.5635	.4915	.4710	.3983	.5499	.5097	.4988	.4905	-.0327
Highest bust-level width																																																	.3246	.5180	.4990	.4681	.3397	.5228	.5008	.4673	.4242	-.0289
Posterior chest width																																																		.4728	.5485	.5397	.4441	.6362	.6117	.5785	.5353	.5424	-.0324
Anterior bust arc																																																			.8244	.7890	.5313	.5965	.8062	.7821	.6999	-.0844
Anterior waist arc																																																				.8933	.5104	.8400	.9141	.8365	.7233	-.0773
Abdominal-extension arc																																																					.5016	.8109	.8539	.8977	.7783	-.0768
Posterior hip arc																																																						.6218	.6429	.7047	.8463	-.0260
Bust girth over foundation garment																																																							.8843	.8434	.7655	-.1004
Waist girth over foundation garment																																																								.8913	.7893	-.0842
Abdominal-extension girth over foundation garment																																																									.8888	-.0721
Hip girth over foundation garment																																																											.9068	-.0571

¹ Overlapping measurements.